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Alabama. Geological survey.

GEOLOGICAL SURVEY

OF

ALABAMA.

EUGENE ALLEN SMITH, Ph. D., State Geologist.

REPORT

ON

THE VALLEY REGIONS OF ALABAMA.

(PALEOZOIC STRATA.)

BY

HENRY McCALLEY,

ASSISTANT STATE GEOLOGIST.

WITH ILLUSTRATIONS.

IN TWO PARTS.

PART II.

ON

THE GOOSA VALLEY REGION.

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PREFATORY LETTER.

DR. E. A. SMITH, *State Geologist*,

SIR :—I had intended that this Part II (The Coosa Valley Region) of the report on the Valley Regions of Alabama (Paleozoic Strata) should be published along with Part I (The Tennessee Valley Region) but circumstances have delayed the printing of Part II. It was also intended that the two parts should be bound together, as they have a good deal in common, but they were found to be too bulky for a single volume with a paper cover.

Part II treats of a region that is so varied in its topographical features, complex in its geological structure, and rich in its economic resources, that I am very much afraid that I have fallen far short of my aim to make it plain in all particulars to all alike. I have the satisfaction however of knowing that I have done my best, and of believing that the report contains much that will prove of interest and value to both the scientific and industrial readers. I have attempted to give the topographic, geologic, and economic features of the region, all of excessive intricacy, in as plain language as possible. These features however have all to be understood, not only in themselves but also in their relations to each other, in order to know this region. The varied topography and the complex geology of this region can be seen at a glance at respectively the Topographical Sheets of the U. S. Geological Survey and the Geological Map of the State, but its rich economic resources can be only partially known by a careful reading of this report from beginning to end. The above Geological Map and the Structure Sections, Plate XXXV of this Report, show that the Coosa Valley Region has all of the geological formations and the most complicated geological structure of the south-western Appalachian Region. They however do not by any means show all of the complications of structure. They do not pretend to go into the minuteness of details and there are doubtless many things of importance connected with the complicated geology of this area that are not now known and most probably never willl be known. The geology of this section is made difficult not only by the great number of formations involved and by complexity of structure, but also by entire changes in the character of contemporaneous strata within short distances both along and across the strike, by the great similarity in the physical appearances of strata of wholly different formations over large areas, and along and near the south-east edge of the region by metamorphosis and the lack of fossils. The working out of these intricacies of the geology has been made the more difficult by the want of a perfect topographical map of the region. The geology as set forth in this report and the structure sections, Plate XXXV, does not exactly conform to that of the Geological Map of the State, published in 1894. The principal difference is in the Aldrich (Beaver) Limestones at the bottom of the Montevallo (Variegated) Shales and Sandstones (Lower Cambrian), being wrongly put down in several places on that map at the bottom of the Siliceous (Knox) Dolomite and Chert Formation (Lower Silurian). The report, however, to be most easily understood should be read along with the State Geological Map.

This report, as a matter of course, is not a complete *resume* of the economic resources of this region, notwithstanding that in trying to make it so most of it has been devoted to economic descriptions. These resources include not only the mineral, agricultural, and timber wealth of this region, but also all other substances indigenous to it that are of special use or interest.

The report presents first generalized, and then detailed descriptions. It is therefore divided into Section III, the generalized description, and Section IV, the detailed description by counties. (Section I and II make Part I, already published). The county descriptions are by formations, and particular stress has been laid upon those formations that are the most important from an economic standpoint. An attempt has been made to give the localities and geological horizons of all the principal economic deposits, with analyses of average samples of each, and to speak of all the best agricultural and timber lands, and water powers.

As stated in Part I, liberal use has been made of the Topographical Sheets of the U. S. Geological Survey, and many of the analyses were kindly furnished, free of cost, by Maj. G. D. Fitzhugh, C. & E. E., L. & N. R. R. Co. and by Dr. W. B. Phillips, Consulting Chemist, T. C. I. & R. R. Co., as was also the article on "*Gold Mining and Marble Industry in Talladega County*," by Dr. Wm. Taylor. To these gentlemen and to Mr. Geo. B. McCormack, Gen. Supt. T. C. I. & R. R. Co., and to all others who assisted me in this work, I again express my sincere thanks.

HENRY McCALLEY.

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PART II.

THE COOSA VALLEY REGION OF ALABAMA.

SECTION III.

PHYSICAL FEATURES, GEOLOGY, NATURAL RESOURCES, SOILS, AGRICULTURAL FEATURES, TIMBER, WATER POWER. CLIMATE, HEALTH, RAINFALL, AND DRAINAGE.

CHAPTER I.

PHYSICAL FEATURES.

Limits, Area. The Coosa Valley Region, as herein defined, embraces most of the counties in Alabama with Appalachian characteristics or all of the Paleozoic strata that are drained by the Coosa and Cahaba rivers and the most south-east of those that are drained by the Warrior River. It therefore comprises all of DeKalb, Etowah, St. Clair, Jefferson, Walker, Shelby, Talladega, Calhoun and Cherokee counties, and parts of Blount, Tuscaloosa,, Fayette, Bibb, Chilton, Coosa and Cleburne counties. Its area is near 8,000 square miles of which about one-half is of Coal Measures.

General Description. This is the most varied portion of Alabama in its physical features. These features show most plainly that they are dependent on the nature of the underlying rocks and on the Geological structure.

They are due to upheavals and denudation. In a general way, they make a very broken country that is characterized by parallelism of its mountains, ridges, and valleys, with a general north-east and south-west direction. The mountains are often majestic in size and abounding in wild scenery, and the valleys are often beautiful and fertile. The irregularities of surface of this region show most plainly that in the denudation of highly tilted strata the harder strata, sandstones, conglomerates, etc., tend to produce ridges, and the softer strata, limestone and shales, tend to produce valleys.

The topographical features of the north-west portion of this region are different from those of its south-east portion. This north-west portion, as a whole, with a maximum altitude of over 1800 feet above sea level, has a higher elevation and is not so badly folded and faulted as the south-east portion. Its mountains, bounded by bluffs, are broad and more or less flat on top, while those of the south-east portion are sharp crested and craggy with steep and bluffy north-west sides and more or less gently sloping south-east sides. The valleys are much more uniform and much better defined in the north-west than in the south-east portion.

NATURAL DIVISIONS.

The principal natural divisions of this region are as follows:

(1) *Broad flat top synclinal mountains bounded by bluffs.* Examples: Raccoon Mountain, Lookout Mountain, Sand Mountain, Dirt Seller Mountain, etc.

(2.) *Uniform anticlinal valleys with sharp well defined limits.* Examples: Wills Valley, Murphrees Valley, Birmingham Valley, Broomtown and Chattooga valleys.

(3.) *Monoclinal mountains with steep north-west sides*

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NOCCALULA (BLACK CREEK) FALLS, NEAR GADSDEN, ALABAMA.

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TILDEN FOUNDATIONS

and gentle south-east slopes. Examples: Shades and Shoal Creek mountains; Green Creek, Colvin, Rock-pile, Frog, and Gaylors mountains; Weisner, Indian, Terrapin, Jacksonville, Coldwater, Alpine, Weewoka, Pope, Kahatchee, Katala, Chalybeate and Sulphur Springs, and Columbiana mountains.

(4.) *Monoclinal valleys with ill defined north-west limits.* Examples: Cahaba and Choccolocco valleys.

(5.) *Flatwoods.*

(6.) *Irregular valleys with jagged edges.* Examples: Coosa Valley proper, Alexandria, Talladega, etc., valleys.

(7.) *Chert hills and ridges.*

(1.) *Broad flat top synclinal mountains bounded by bluffs.*

These mountains make up the greater part of the central portion of the Paleozoic territory in Alabama. They are partly of this region and partly of the Tennessee Valley Region. Those of this region are therefore along or near its north-west boundary, two of them having only their south-east portions in this region, their north-west portions being within the Tennessee Valley region. They are broad shallow synclinal basins with a north-east and south-west trend and hence are most elevated along their north-west and south-east edges. They make well drained, healthy, beautiful countries that, in a general way, are gently rolling away from the water courses and for the most part are broken along the water courses and the edges of the mountains, where they present many wild and picturesque scenes and some very extensive and grand views. The accompanying Plate XI is a view of one of their water-falls.

Raccoon and Lookout mountains are good types of this group. The former is an extension to the south-west into Alabama of the Walden Ridge and the latter of the Lookout Mountain of Tennessee. The former gradually merges into Sand Mountain and the Warrior basin on the south-west while the latter is suddenly stopped by the transverse fault between Gadsden and Attalla. They both gradually slope from an average height of about 1600 feet above tide water level at the State line to one of about 1000 feet at their south-west ends. They together cover about 1000 square miles of this region. They are of the Coal Measures and have a yellowish sandy soil that is naturally poor, though it makes fine natural pastures and grows well, without help, root and fruit crops. With help or with frequent light applications of a suitable compost, this naturally poor soil grows well a great variety of crops. It is most easily cultivated. Its large growth is of oaks, hickories, pines, etc.

Sand Mountain. The Sand Mountain of this region, also called in places the Rock Mountain, is the extension of Raccoon Mountain to the south-west. It is the south-east side of a broad syncinal, the Warrior Coal Field, whose north-west side is the broad Sand Mountain of the Tennessee Valley Region.The Sand Mountain of this region is therefore most elevated along its south-east edge. It also gradually slopes from an elevation of about 1000 feet above sea level at its north-east end to one of about 300 feet at its south-west end where it becomes covered up by newer strata. It extends to the south-west of Vances, though the prominent south-east edge is engulfed in a fault for several miles opposite Pratt City. If made to include the Warrior basin proper, it embraces some 3000 square miles. It is a broken country. Its soil, timber, etc., are similar to those of the two mountains last considered.

Dirt Seller Mountain is of this group only next to the

Georgia line, the rest of it to the south-west being a monoclinal mountain. As a synclinal, it does not cover over 15 square miles of this region. As such, it is a sub-synclinal of a broad anticlinal that extends from Lookout Mountain on the north-west to the Rome Thrust Fault on the south-east. It is from 700 to 1500 feet above tide water level. It is mainly of the Red Mountain and Sub-carboniferous strata. It is a broken country with soils that vary from a light colored poor rocky sandy soil to a deep red fertile sandy loam. Its large timber is of pines, oaks, hickories, poplars, etc.

(2.) *Uniform anticlinal valleys with sharp well defined limits.*

These valleys are washed out unsymmetrical anticlinal mountains or folds that are usually faulted on the steep sides, most commonly the north-west sides. They are confined to the central portion of the Paleozoic territory and hence, while they are principally in this region, are partly also in the Tennessee Valley Region. They have a great diversity of scenery, though they have a great similarity to each other in their topography and form. They are long narrow trough-shaped valleys with a north-east and south-west trend that separate the broad flat top synclinal mountains and are usually bounded by rock walls or bluffs. They present the anomaly in Alabama, with one exception, of being valleys that are higher than the mountainous country on each side of them away from the elevated rims. They are fringed on both sides with ridges and valleys except where such are engulfed in faults. The frontispiece, Plate X, is a view of a gap through the fringing ridges of one of these valleys. They also usually have a central belt of knobby hills and short ridges in a confused mass. The ridges are usually taller and the valleys broader on the south-east sides of these anticlinal valleys than on the north-west sides, because the strata are usually more engulfed in faults and steeper on the north-west sides. This state of things, however, is sometimes reversed. The fringing ridges and valleys have often a remarkable uniformity of character, though they differ from each other more or less in their size and sharpness of outlines and agricultural features. The main ridges in several of the valleys are known as East and West Red Mountains according as they are on the south-east or north-west sides of the anticlinal valleys, and because they have in many places a deep red sandy loam from the weathering of outcrops of hematite or red iron ore.

These anticlinal valleys show that they are strictly dependent on the geological structure. They show in the dip of their strata from near the edge of the faulted or steep dip side, usually the north-west side, towards both sides that they are of unsymmetrical anticlinals. Their dip, however, in places where a fault forms a boundary to the valley, is all in one direction, away from the fault. They are therefore in these places true monoclinal valleys, but none of these places extend for any great distance. These anticlinal valleys vary in altitude from about 1,000 feet above sea level at the Georgia line to about 500 feet at their south-west end near Vances. Their comparative altitude is shown by the fact that their streams do not run down them any great distance before breaking through the elevated bluffy edges on one side or the other into the lower mountainous country beyond.

These anticlinal valleys cover some 800 square miles of this region. They are in many places rich in red and brown iron ores and have some extensive deposits of refractory and plastic clays. Their limestones and dolomites, suitable for fluxing and lime burning purposes, and their building stones, may be said to be almost inexhaustible. They also have some other minerals, as manganese, barite, etc.

Their soils are of almost every kind from a very poor light gray siliceous or sandy soil to a very rich black waxy limy soil. The different soils are in long narrow belts to correspond with the ridges and valleys or with the underlying strata. The timber is mostly of the hard variety, though there is some short leaf pine. The water supply is good,big lasting springs abounding in nearly all sections.

Wills Valley, including Big and Little Wills valleys, separates Raccoon Mountain on the north-west from Lookout and Chandler mountains on the south-east. It therefore extends from the Georgia line to the south-west to the head of Greasy Cove, a distance of some 70 miles. As it has an average width of nearly five miles, it embraces nearly 350 square miles of this region. *Big Wills Valley* comprises the most of it, the portion drained by Big Wills Creek or all of the valley to the north-west of East Red Mountain, *Little Wills Valley* including only the portion drained by Little Wills Creek or the narrow symmetrical valley between East Red Mountain and Lookout Mountain. Wills Valley has along near its north-west edge a fault that in places completely engulfs the strata of West Red Mountain and those of other formations. *Sand Valley*, just to the north-west of West Red Mountain, is the counterpart of Little Wills Valley, though it is much narrower. West Red Mountain is, as a general thing, a much smaller mountain than East Red Mountain. The central portion of Wills Valley is of a very broken belt of cherty and the valleys broader on the south-east sides of these anticlinal valleys than on the north-west sides, because the strata are usually more engulfed in faults and steeper on the north-west sides. This state of things, however, is sometimes reversed. The fringing ridges and valleys have often a remarkable uniformity of character, though they differ from each other more or less in their size and sharpness of outlines and agricultural features. The main ridges in several of the valleys are known as East and West Red Mountains according as they are on the south-east or north-west sides of the anticlinal valleys, and because they have in many places a deep red sandy loam from the weathering of outcrops of hematite or red iron ore.

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Murphrees Valley, being an unsymmetrical anticlinal valley cut down into Raccoon Mountain, starts up suddenly or in bluffs on the north-east and opens out into the Birmingham Valley on the south-west. It has a length of about 25 miles and an average width of over 3 miles, it therefore has an area of over 80 square miles. Its head or north-east end is known as Bristow's Cove. The portion of Raccoon Mountain to the south-east of it is an unsymmetrical synclinal called *Blount Mountain*.

This valley differs from a typical anticlinal valley of the Appalachian Region or from Wills Valley in that its steep strata with their fault is on and near the south-east edge of the valley. Its fringing ridges and valleys therefore present the unusual sight of being smaller and narrower on the south-east side of the valley than on the north-west side. In its upper or north-east portion, where the fault forms its south-east boundary for a short distance, this valley is a monoclinal valley with a dip of all of its strata towards the north-west. It is drained into the Locust Fork of the Warrior River by streams that cut across it. Its red and brown iron ores and its fluxing rocks or limestones have been mined and quarried to a considerable extent. It also has perhaps the largest manganese deposit in the State.

The *Birmingham or Long Valley*, as herein described, ncludes not only the old Jones and Roup valleys but also the Shades and Opossum valleys. Murphrees Valley, properly speaking, is but a fork of this valley around to the north-west of Blount Mountain, the other fork around to the south-east of this mountain opens out into a great body of flatwoods to the north-east of Springville. The Birmingham Valley may therefore be said to extend from Springville on the north-east to Vances on the south-west, and from the Warrior Coal Field or Sand Mountain on the north-west to the Cahaba Coal Field or Shades Mountain on the south-east. It is gradually lost to the south-west of Vances in a broken country of overlying unconformable recent strata, Cretaceous (Tuscaloosa) and Tertiary (Lafayette). It therefore has a length of nearly 75 miles and an average width of over 6 miles. It thus embraces nearly 450 square miles. The old Jones and Roup valleys are respectively its north-east and south-west ends. Shades Valley is the south-east portion of it, the portion to the south-east of East Red Mountain or between this mountain and Shades Mountain (Cahaba Coal Field), and the Opossum Valley is the north-west portion, the portion to the north-west of the central belt of cherty ridges, the Cemetery Ridge, or between this ridge and the Sand Mountain (Warrior Coal Field).

This anticlinal valley is not only much longer, broader and deeper, geologically speaking, than the other uniform anticlinal valleys of the State, but it is also of much more varied topography and geological structure, especially near its north-east and south-west ends. Its complication of structure and geology is due mainly to minor, though large, folds and faults. One of these minor folds near the north-east end of the valley, not only duplicates East Red Mountain but also makes of this duplication a broad pointed synclinal mountain that encloses within its shallow basin the head waters of B Cahaba River. This synclinal mountain divides t central portion or lower formations of the valley in two parts. The smaller or south-east of these parts known as *Mahans Cove.*

Another of the minor folds doubles West R Mountain near the south-west end of the Birmi ham Valley. This duplication, *McAshan Mounta* is a monoclinal mountain with a dip to the north-w or is merely the south-east part of an unsymmetri synclinal whose steep and crumpled north-west side w obliterated by a fault. These minor folds also tripli ted the belts of cherty ridges in the central part of t valley, the central belt of the triplication, the Ceme Ridge and Salem Hills, being of an unsymmetrical sy clinal with the steep strata and faults along the sou east edge. To the south-east of this broken and fault central synclinal or between it and the southeast belt cherty ridges there is a belt of flatwoods over 40 mi long with a maximum width of nearly 2 miles. T belt starts in near Chalkville P. O. and extends un Birminghan and Bessemer to about opposite Vances. gradually gives out at each end as the valley becom shallower, geologically speaking. There are also so flatwoods to the north-west of the above broken cent synclinal or in Opossum Valley.

The steep strata of the Birmingham valley as a wh are along near its north-west edge, though, owing the minor folds and faults, steep strata occur also alo near the south-east edge of the north-east end of the v ley or along the south-east edge of Mahans Cove, a along the south-east edge of the central synclinal of valley or the Cemetery Ridge. The comparative a tude of the Birmingham Valley is shown not only

e fact that its streams do not run down it any consid-
rable distance before breaking through one or the other
the elevated rocky rims but also by the fact that it
the water divide between the Warrior and Cahaba
vers. In a general way, the Warrior river drains its
orth-west half and the Cahaba river its south-east half.
Its red ore, most highly developed in East Red Moun-
in between Birmingham and Bessemer, has furnished
early all of the ore for the 26 furnaces in the Birmingham
istrict. Plates XV, XXIII, XXIV, XXV and XXXI, are
the mines in this red ore. Its limestones and dolomites
ave furnished most of the flux for the above furnaces.
s brown ore supplied one of the first Catalan forges
hat was ever built in the State and is supplying most of
e brown ore that is now used in the Birmingham dis-
rict. Its sandstones have been used some for glass
aking and for heavy masonry, as foundations, and its
ags for paving and curbing purposes. Its chert has
en used extensively for road making.

Broomtown Valley, as herein described, embraces all of
e country between Lookout and Dirt Seller mountains.
s strata however extend several miles to the south-west
the south-west end of the Dirt Seller Mountain or to
ound Mountain, its north-west strata extending even as
r to the southwest as Gadsden. Considering the valley
wever as stopping with Dirt Seller Mountain or Lit-
River, it is 15 miles long by 5 in width. It there-
re, as thus limited, has an area of about 75 square miles.
This valley, as defined above, is not a symmetrical
ticlinal valley, as its West Red Mountain, Shinbone
dge, and overlying formations have no representa-
es on the south-east side of the valley, the counter-
rt of Shinbone Ridge being the north-west rim of Dirt
llers Mountain which, as above defined, is without or

to the south-east of the valley. The valley is the den
ded north-west or tallest anticlinal fold of a broad u
symmetrical complex anticlinal which includes D
Seller Mountain as a subordinate synclinal. Its ste
strata are therefore on its north-west side. The valle
as a whole, is a broken country, as it is made up for t
most part of a broken central belt of cherty ridges. I
best and most extensive farming lands are along
south-east edge. It is drained into the Coosa River.

Chattooga Valley comprises the country betwe
Dirt Seller Mountain and Gaylors Ridge. It opens o
into a great body of flatwoods on the southwest, fro
which it is separated by the Rome Cahaba Thrust Fau
It is therefore only about 5 miles in length by 2
width. Like Broomtown Valley, it is a denuded subo
dinate anticlinal fold of a broad unsymmetrical compl
anticlinal that includes both Dirt Seller Mountain a
Gaylors Ridge or that extends from Lookout Mounta
on the north-west to the Rome Thrust Fault along t
south-east foot of Gaylors Ridge on the south-east. I
north-east end is a symmetrical valley, but its sout
west end with its steep strata and a fault along its nort
west edge, is not symmetrical. It, as a whole, is a brok
country, as it is made up mostly of the broken centr
belt of cherty ridges. Its limestones in places wou
answer very well for marble or are hard enough to ta
a very good polish. It is drained by Chattooga Riv
into the Coosa River.

(3) *Monoclinal Mountains with steep north-west sides a gentle south-east slopes.*

These mountains form some of the most striki
topographical features of this region. They have a remar
able uniformity in their general north-east south-we

direction and some of them are continuous for many miles or across entire counties. They are made up of the outcrops of hard strata, principally sandstones and conglomerates, with a general dip towards the south-east. The north-west ones are the elevated north-west rims of unsymmetrical synclinals whose south-east rims of steep strata have been engulfed in faults, and the south-east ones are just to the south-east of great thrust faults. They are of three classes, according as the hard capping strata are of the Coal Measures, Red Mountain formation, or Weisner formation. Those of each of these classes have a remarkable likeness to the others of the same class. The most south-east ones, those of the Weisner strata, though they bear a strong resemblance to each other, are the least uniform in their general characters, because they are much more broken and faulted.

Among the most important of these mountains are the Shades and Shoal Creek mountains of the Coal Measures; the Green Creek, Colvin, Rock Pile, Frog, and Gaylors mountains of the Red Mountain formation; and the Weisner, Indian, Terrapin, Jacksonville, Alpine, Weewoka, Pope, Kahatchee, Katala, Chalybeate, Sulphur Springs, and Columbiana mountains of the Weisner formation.

There are a great many high ridges capped with the Fort Payne Chert that would properly come in this group of monoclinal mountains. Like the mountains of the Weisner formation, they are just to the south-east of faults.

Shades Mountain, the elevated north-west rim of the Cahaba Coal Field, and *Shoal Creek Mountain*, the elevated north-west rim of the north-east part of the Coosa Coal Field, are of the hard conglomerates and sandstones near the base of the Coal Measures. The former of these is from 25 to 30 miles long and from 1000 to 1100 feet above sea level, and the latter is some 30 miles long with a height of from 1000 to 1200 feet above sea level.

Green Creek and *Colvin mountains*, are the respectively south-west and north-east halves of the mountain that bounds Ohatchee Creek Valley on the north-west. They are separated from each other merely by Davis' Gap where they lap for a couple of miles. The former is from 10 to 12 miles long and from 900 to 1100 feet above sea level, and the latter is about 15 miles long and from 1000 to 1200 feet above sea level. They both carry several seams of red ore that is in places of good quality and that in one place, at least, in the Colvin Mountain is said to be thick enough to be worked profitably.

Rock Pile, *Frog*, and *Gaylors mountains* are capped with hard sandstones and conglomerates that on Rock Pile Mountain may be Sub-carboniferous (Oxmoor Shales and Sandstones) and on Frog Mountain partly Devonian. No red ore of any value has been seen in any of these mountains.

Rock Pile Mountain is several miles in length, though the name is usually applied only to the high peak, over 1100 feet above sea level, at its north-east end several miles west of Alexandria. The central and south-west portion of this mountain is also called the *Chalybeate Spring Mountain*. It has on it some seemingly very good banks of limonite.

Frog Mountain is a very peculiar and irregular shaped mountain a few miles to the north-west of Spring Garden. It is made up of three broken ridges with an eastward dip, separated by faults, that gradually rise towards the north and suddenly end on the north in high butts that are sharply bent towards the east. The main mountain, made up of the northern or butt ends of these ridges, has therefore a couple of low gaps in it. This main mountain is a couple of miles long from east to west and its highest peak is something over 1225 feet above sea level. It has a couple of spurs or ridges extending out from its eastern end.

Gaylors Ridge is a high broad mountain that extends from Georgia several miles down into Cherokee county, Alabama. It is some two miles broad and gradually slopes from its elevated north-west rim, which is from 1500 to 1600 feet above sea level, to its south-east edge which is about 1000 feet above sea level.

The *Weisner strata mountains* are identical in area with that formation. They are of sandstones, quartzites, conglomerates, and shales. They are all faulted complex anticlinals or of great faulted anticlinals that are made up of smaller folds that are frequently faulted. Their strata are therefore frequently repeated in the ridges and spurs of the same mountain, These mountains are so broken and bluffy that they often cannot be crossed for miles, except on foot, and hence are for the most part still covered with their native forests. Their sandstones, soft when first quarried and hard on exposure, are often fine building stones. They are frequently varigated. These mountains have in their top strata, in many places, fine deposits of limonite; in other places, deposits of gray magnetic iron ore; in still other places, red iron ore; and in still other places, manganese ore, all at the same geological horizon.

Weisner Mountain is a broken crescent shaped mountain that rises from 800 to 1200 feet abruptly from the flatwoods south of Centre. It is therefore a very conspicuous land mark. It is several miles in length and from 1500 to over 1900 feet above sea level. Its bluffy outcrops have broken down in places until they make heaps, acres in extent, of loose quartzites. Faults, minor ones, occur also just to the south-east of this mountain.

The *Indian Mountains* are the broken mountains and mountain spurs to the north of the East Tenn. Va. & Ga. R. R. in the south-east corner of Cherokee county. They are merely the extension to the north-east of the Terrapin Mountains. They with their general north-east and south-west direction are cut up by faults. They are the faulted folds of a great faulted anticlinal. They extend down into Alabama 5 to 6 miles and are several miles in width. They vary in heighth from about 1000 to nearly 2000 feet above sea level.

The *Terrapin* or *Ladiga Mountains*, in their extent from the above railroad near the Georgia line to the south-west to White Plains, are between 20 and 25 miles in length. Their highest points are from about 1600 to 2000 feet above sea level. Their north-east portion, the portion between the East Tenn. Va. & Ga. and East and West railroads, is similar to the Indian Mountains or is of a number of mountains, spurs, and ridges, that are separated from each other by faults. To the south-west of the East and West Railroad, the mountains are high and uniform until they begin to gradually die out at their south-west end. They are lapped by reason of faults for several miles at their south-west end, or from opposite Piedmont, with the north-east end of the Jacksonville or Choccolocco Mountains.

Jacksonville or *Choccolocco Mountains* are a high range of mountains that extend from Piedmont to Oxford, a distance of about 25 miles. Their highest points are from 1800 to 2000 feet above sea level. These mountains in many places can be seen to be complicated by folds and faults, repeating the strata in ridges, spurs, and peaks. The faults usually have a more north-east and south-west direction than the general trend of the mountains and so they can, in many places, be seen to run into the mountains. These mountains have in their top strata many limonite deposits and near their north-east end some bauxite deposits also.

Coldwater Mountain, a detached broken mountain to the west of Oxford, might be called the south-west end of the Jacksonville or Choccolocco Mountains. It has extending out from it towards the north-east a number of spurs that are just to the south-east of faults that run up into the mountain. This mountain as it sinks below the surface at its north-east end can be seen to be of a faulted anticlinal.

The *Alpine Mountains* or *Talladega Hills* extend from north-east of Talladega to the south-west to near Alpine, a distance of nearly 18 miles. They, as a whole, are not so high and broad as some of the mountains considered, though their highest peaks reach an altitude of between 1500 and 1600 feet above sea level. They in places are also of double mountains and ridges, of the same strata repeated by faults. They however show a complete anticlinal as they dip below the surface at their extreme north-east end. They have some good banks of limonite in their top strata.

The *Weewoka Mountains* are several more or less parallel high ridges that are separated by faults, They are from three to four miles in length and about 800 feet above sea level. They have in their top strata some fine limonite deposits and some thick seams of gray magnetic ore.

Pope or *Adeluvia Mountain*, a high peak near Sycamore, might be looked upon as the curved north-east end of the Kahatchee Mountains. It has in its upper strata some limonite and some flattened scales and pieces of black and [illegible] that is high in magnetic properties.

[illegible] *Mountains* are the cresent shape mountains [illegible] Sycamore and Childersburg, though this [illegible] applied only to the broken south-west [illegible] mountains or the hand-shaped broken mountains [illegible] with finger like spurs between Fayetteville and Childersburg. The main mountain between [illegible] Childersburg is between 16 and 18 miles [illegible] places is over 1200 feet above sea level. It [illegible] top strata some good deposits of limonite and [illegible] gray magnetic ore.

[illegible] *Mountains* are just to the west of the hand- [illegible] end of the Kahatchee Mountains, with only a nar- [illegible] faulted shallow synclinal between them. They are [illegible] main prongs, separated by faults, some 5 miles long, with a general north and south trend, extending south ward to near Fayetteville. They are from 700 to [illegible] feet above sea level.

The *Chalybeate* and *Sulphur Springs Mountains* are the continuation to the south of the Katalia Mountains, there being only a fault and narrow gap between them. From their northern end near Fayetteville to where they butt up against the Talladega Slates is about 8 miles. Their highest point, Sulphur Spring Peak, is something [illegible] 10[illegible] feet above sea level. They have some roofing slate [illegible] also some limonite and gray ore in their top strata.

[illegible] *M*[illegible], east of Columbiana, are [illegible] south-west end of a canoe-shaped [illegible]. Their length around the synclinal is [illegible] their highest point about 1[illegible] feet [illegible]. At and to the south-east of the point of [illegible] are spurs or ridges that are doubt- [illegible] from each other and the mountain proper by faults. In the synclinal or in the top strata of the mountains, there is some very good red iron ore.

(4.) *Monoclinal valleys with ill defined and irregular north-west limits.*

These valleys are either just to the south-east or north-west of faults. Their topographical features depend in a great measure on their geological formations. The most important of them are the Cahaba and Choccolocco valleys.

Cahaba Valley.—This valley, as herein described, embraces all of the country between the Cahaba and Coosa coal fields. It is therefore some 55 miles in length by nearly 3 miles in width, with an area of over 150 square miles. It is a denuded unsymmetrical anticlinal whose steep strata, on the north-west side, are engulfed in a fault. It is fringed on the south-east side with the parallel ridges and valleys and also has the central belt of knobby cherty ridges. It therefore resembles in its topography, etc., the monoclinal places with a south-east dip in the uniform anticlinal valleys. Its different soils are in long narrow north-east and south-west belts to correspond with the underlying strata. It is drained by the Cahaba River.

Choccolocco Valley.—This valley lies between the Jacksonville or Choccolocco Mountains on the north-west and the broken country of Talladega Slates on the south-east. Its north-east end however is bounded on the north-west by the Terrapin or Ladiga Mountains. It is therefore nearly 30 miles in length and nearly 5 miles wide at its broadest part. Its area is near 75 square miles. It is a beautiful fertile valley that is almost entirely in cultivation. There is however in its north-east end, especially, some mountainous knolls and short ridges that are still covered with their virgin growth.

In the upper strata of some of these [knolls and ridges, there are some fine limonite banks.

(5.) *Flatwoods.*

The flatwoods are marked topographical features of this region. They are comparatively flat except where they are made rolling by knolls and low ridges of superficial deposits of recent unconformable strata of Tuscaloosa and Lafayette ages. They are from 500 to 750 feet above sea level, though they are but little elevated above the Coosa River, their drainage channel. They, as a general thing, are but poorly drained. Their soils are therefore commonly cold and wet and hard to cultivate and so they are for the most part still in their virgin forests of post oaks, short leaf pine, etc. Where covered over with the superficial sandy and gravelly loams of the Tuscaloosa and Lafayette formations, they frequently have extensive forests of long leaf pine. They are of two belts. The greatest by far of these belts enters Alabama from Georgia along the Coosa River and extend to the south-west for over 60 miles or to near Springville. Its south-west end or the portion south-west of Gadsden however is divided into two parts by the Canoe Creek Mountains. This belt varies in width from about 3 to 16 miles with an average of about 9 miles. Its area is therefore over 550 square miles.

The other belt is in the Birmingham Valley. It is a long narrow belt, being nearly 50 miles long and less than 2 miles in width at its widest part. It covers less than 50 square miles. It is drained mostly into the Warrior River, the creeks of its south-west end however go into the Cahaba River.

(6.) *Irregular Valleys with jagged edges.*

These valleys are in a very broken country. They have extending out into them ridges that make their edges very uneven or jagged. They are however, as a whole, gently rolling beautiful valleys of principally a fertile red loam that is almost entirely in cultivation. They comprise the best farming lands of this region. They abound in big limestone springs and in lime sinks. There are many of these valleys. The most important or largest are, the *Coosa Valley proper*, the *Talladega Valley*, and the *Alexandria Valley*.

The *Coosa Valley proper* may be said to extend from north-east of Old Easta Boga to the south-west of Easonville, a distance of some 20 miles. It varies very much in width, though its average width may be put down at about 3 miles. It therefore has an area of over 50 square miles. It is however cut up more or less by barren hills and ridges.

The *Talladega Valley* may be said to extend from some 5 miles north-east of Talladega to the south-west of Mardisville, a distance of some 12 miles. Its width varies, though it will average perhaps over 3 miles. It therefore has an area of between 35 and 40 square miles. It is a beautiful rolling valley of fine farms.

The *Alexandria Valley* extends from a couple of miles north of Alexandria to the south-west of Martins X Roads, a distance of between 6 and 7 miles. Its variable width will average perhaps over 2 miles. Its area is therefore between 10 and 15 square miles. It is for the most part of fine farming lands.

(7.) *Chert hills and ridges.*

These belts cover a good portion of this region. They have a general north-east and south-west direction, notwithstanding that they are made up of hills and ridges that run in all directions. They are therefore badly broken and on account of being badly broken and rocky and of a sterile soil they are but little, comparatively speaking, in cultivation. They usually have a thick residual material of principally chert. They are often scarce of water, the water sinking in the residual material and underlying porous strata to rise in big springs around the edges of the broken belts. Their edges are made jagged by the indentation of pointed valleys. They are of many separate bodies. The principal of these are the belt that extends from the Georgia line to the south-west to Dukes Station, the belt that extends from several miles north of Anniston to the Coosa River west of Lincoln, and the belt along the Coosa River from Choccolocco Creek to the south-east of Childersburg. The first of these belts covers from 65 to 70 square miles and the other two are of about 150 square miles each.

The mineral wealth of these belts consist principally in limonite and bauxite deposits. The limonite has been dug extensively in many places. Plates VII, XVI, XVII, XXIX, XXX, and XXXIII are of some of these diggings. The bauxite banks are seemingly by far the most important of this ore that have ever been worked in the United States. They have furnished for several years and are now furnishing nearly all of the bauxite that is mined in the United States. Plate XVIII and Figures 15, 16 and 18 are of some of these bauxite mines.

These belts have also deposits of barite, tripoli or polishing powder. and kaolin. They are still covered in a great measure with their native timber of Spanish and black jack oaks and of long and short leaf pines. The long leaf pine, of fine growth, form in places extensive forests.

CHAPTER II.

GEOLOGY.

The geological features of this region are very complicated, much more so than those of the Tennessee Valley Region, as can be seen from the structure sections, Plate XXXV, and the State Geological Map, published in 1894. These complications are due in a great measure to denudation and to folding and faulting.

CHANGES DUE TO DENUDATION.

Denudation has made out of this region almost a new country both as to its topography and geology. It has washed out the softer strata into valleys and made ridges out of the harder ones. It has cut the formations into long narrow ribbons and has removed many of them, amouting to from 2500 to 3000 feet of strata or from 1½ to 2 miles in thickness of strata, from over large sections of country. Fig. 5 is an illustration of the wasting effects of weathering or of how the mountains are now gradually losing their heights or are being washed away. Plate VIII is a very similar illustration, though of a different rock.

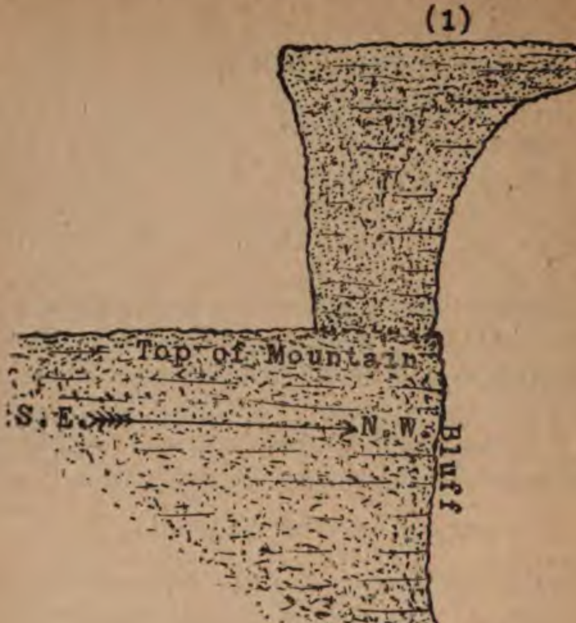

Fig. 5. Rough sketch of "Pinnacle Rock" on brink of Lookout Mountain ½ mile north-east of Mentone. (1) View from the north-east. (2) View from the south-east.

FOLDS AND FAULTS.

Folding and faulting have also done a great deal in making the vast changes that have taken place in the geology of this region. Had it not have been for their agency in folding and breaking up the strata, denudation could not have done its great work. Their influence increased as they increased in number and size towards the southeast. Their increase in number and size towards the south-east is shown in the Structure Sections, Plate XXXI. They have cut up and repeated many times in narrow belts the geological formations of this region.

The larger folds are complex folds or are made up of minor folds and these in turn are frequently made up of still smaller folds and wrinkles. The folds are commonly unsymmetrical or have steeper strata on one side than on the other. The steeper strata are most frequently on the north-west sides. The folds vary in length from top of crest to top of crest from a few feet to 10 to 12 miles. The major ones extend 75 to 100 miles in a north-east and south-west direction. They either die out gradually at their ends or are stopped suddenly by transverse faults. They frequently interlap at their ends somewhat like saw teeth. Plate XXVIII is a view of sharply folded, contorted, and broken up strata.

The faults occur along the lines of least resistance or in the steep strata of the folds. They are sometimes much longer than the folds, extending from fold to fold; at other times they are about co-extensive with the folds, and at still other times they are much shorter than the folds. They overlap each other and are frequently repeated in a fold. It is a most common thing for a jor fault to be accompanied by minor faults, r shear faults. The major faults are sometimes r ning into each other. The faults with the strike of the strata or are *strike* many of them cross the strike of the strata Most of them, perhaps all of the are *thrust faults* or are faults along which pushed over towards the north-west. *overthrust faults* when older strata are on top of younger strata and *underthrust* younger strata are thrust under the older north-west. The same fault can be seen places from an overthrust to an underthrust reverse. The *hade*, or the angles made by the faults with vertical planes, vary from nearly 90 degrees. The *hade* is greatest, as thing, with the greatest faults or with the greatest displacement. In some of the cases greatest, the older strata have been pushed miles towards the north-west on top of the strata. The faults with a great *hade* are usu- crooked.

faults of this region are innumerable, the major however, commencing with the most north-west about as follows:

Wills Valley Fault.
Murphrees Valley and Little Basin Fault.
McAshan Fault.
Gadsden, Attalla, and Shades Valley Fault.
Rome and Cahaba Fault.
Eden Fault.
Yellow Leaf Fault.
Coosa (Weisner and Ohatchee) Fault.
Pell City Fault.
Columbiana and Sheby Springs Fault.
Tallasseehatchee Fault.

5. K
½ mile
View fro

(12) *Terrapin Fault.*
(13) *Jacksonville Fault.*
(14) *Renfro and Childersburg Fault.*
(15) *Sulphur Springs Fault.*
(16) *Talladega Fault.*

These faults are shown on the Sketch Map of the State, Plate I, Part I.

(1) *Wills Valley Fault.* This fault occurs along the north-west edge of the south-west portion of Wills Valley. It can be traced for some 30 miles. For most of this distance it is along just to the south-east of West Red Mountain. The Pelham Limestones are the main strata engulfed by it, though in places, especially near its south-west end, it engulfs all of the Red Mountain and most of the Sub-carboniferous strata. Its maximum vertical displacement is therefore something like 3000 feet.

(2) *Murphrees Valley and Little Basin Fault.* This fault, starting at the north-east end of Bristow's Cove or Murphrees Valley, runs down the south-east edge of this valley for its whole length as an underthrust fault, and then gradually changes to an overthrust fault between Village Springs and Mount Pinson or as it passes over to the north-west edge of the Birmingham Valley. It continues down the north-west side of this last valley to the south-west of Dolomite or to about opposite Bessemer where it enters the Warrior Coal Field and then on to the south-west, dividing the Little and Big Basins of the Warrior Field, to Clements, where it becomes hid or covered up by superficial deposits of unconformable strata of Cretaceous and Testiray ages. It can therefore be traced for all of 100 miles. For much of this distance, it engulfs all of the Pelham Limestones and some of the Siliceous (Knox) Dolomite and Chert and Red

Mountain strata. All of these three formations and all of the Sub-carboniferous strata and most of the Coal Measures are engulfed in places. Its greatest vertical displacement of nearly 2 miles or some 9000 feet, opposite Pratt City, brings middle Cambrian strata (Coosa (Flatwood) Shales) in contact with the upper Coal Measures of the Warrror Field.

(3) *McAshan Fault.* This fault occurs along the north-west edge of the Birmingham Valley from about opposite Bessemer, where it leaves the Murphrees Valley and Little Basin Fault, to the south-west of Vances or to where it becomes covered up or hid by superficial deposits of unconformable Cretaceous and Testiary strata. It can therefore be traced for a distance of some 30 miles. Near its north-east end, it completely engulfs West Red Mountain for a couple of miles, and in McAshan Mountain it duplicates the West Red Mountain for 8 to 10 miles. Its greatest vertical displacement of some 5000 feet near its north-east and south-west ends brings Upper Cambrian in contact with Upper Sub-carboniferous strata.

(4) *Gadsden, Attalla, and Shades Valley Fault.* This fault beginning near Gadsden, where it branches off from the Rome and Cahaba Fault, bends around by Attalla to Springville, where it changes from an overthrust to an underthrust fault, and runs down, just to the north-west of East Red Mountain, into Mahan's Cove to its head near Trussville and thence into Shades Valley, where it changes back to an overthrust fault and continues, as an overthrust fault, down this valley to the south-west end about opposite Tannehill. It can therefore be followed for some 80 miles. It is a strike fault with the exception of the distance between Gadsden and Attalla where is to be found its greatest vertical displacement

of some 6,500 feet or where the Coosa Shales (Middle Cambrian) are brought in contact with Coal Measures.

(5) *Rome and Cahaba Fault.* This fault enters Alabama from Georgia just north of the Rome and Decatur Railroad, bends around to the west, thus cutting off Gaylors Ridge and Dirt Seller Mountain, and then to the south-west by Round Mountain and to the east of Gadsden to the north east end of the Canoe Creek Mountains, then along just to the south-east of these mountains to the scuth-east end of the Cahaba Coal Field and then as the south-east boundary of this coal field to where the Coal Measures and the fault become hid or covered up by superficial unconformable Cretaceous and Testiary strata. It can therefore be followed in Alabama for about 150 miles. It is a strike fault except at its north-east end. Its greatest displacement is along the south-east edge of the Cahaba Coal Field, opposite Montevallo, where the Lower Cambrian strata, the Aldrich (Beaver) Limestones, have been pushed over on top of the uppermost Coal Measures. The vertical displacement here must be some 13000 feet or near 2½ miles. Its least displacement is near Gadsden where it is entirely within the Coosa Shales.

(6) *Eden Fault.* This fault bounds the north-west half of the Coosa Coal Field on the south-east. It can be traced for some 65 miles. Its maximum vertical displacement of some 2500 feet brings Pelham Limestones in contact with Coal Measures.

(7) *Yellow Leaf Fault.* This fault bounds the greater south-east portion of the Coosa Coal Field on the south-east. It can be followed for nearly 25 miles. Its maximum vertical displacement must be all of 2000 feet.

(8) *Coosa (Weisner and Ohatchee) Fault.* This great overthrust fault enters Alabama from Georgia nad

bounds on the south-east the great body of flatwoods along the Coosa River. It bends around the Weisner and Pine Mountains and then passes on to the head waters of [illegible] Creek to form the south-east boundary of [illegible] Creek Valley. It can thus be followed for nearly [illegible] miles within Alabama. Its maximum vertical displacement must be near [illegible] feet.

8. Pell City Fault. This great overthrust fault can be traced from near [illegible] on the East and West Railroad to the south-west by way of Pell City to the Coosa River near Wilsonville, a distance of over [illegible] miles. Its greatest vertical displacement must be [illegible] of 2500 feet. The Silurian [illegible] Knox Dolomite and Chert strata to the south-east of this fault have in one place, at least, been thrust nearly [illegible] miles to the north-west over on top of [illegible] Shales and Sandstone strata.

[illegible] Springs Fault. This fault can be followed from the Coosa River near Wilsonville by way of Columbiana, Shelby Springs and South Calera for some [illegible] miles or until it becomes hid or covered up by superficial recent deposits. Its greatest vertical displacement of from [illegible] to [illegible] feet brings Lower Cambrian Montevallo Variegated Shales in contact with Upper Subcarboniferous strata.

[illegible] Fault. This great overthrust fault passes from near Frog Mountain [illegible] the north-west of [illegible] Talladega(?) [illegible] Tallaseehatchee Creek to north of Alexandria, a distance of some 25 miles. Its greatest vertical displacement of from 7000 to [illegible] brings Lower Cambrian Montevallo Variegated Shales in contact with Upper Subcarboniferous strata. [illegible] strata can be seen in many places [illegible] and at the south-west end of the fault or north of Alexandria they have been pushed near a mile towards the north over on top of the Sub-carboniferous strata.

(12) *Terrapin Fault.* This great overthrust fault bounds the Indian and Terrapin mountains on the north-west. It therefore extends from the Georgia line south-west of Cave Spring to White Plains a distance of some 40 miles. The Weisner strata to the south-east of it can be seen in places to overlie Pelham Limestones, the vertical displacement therefore in these places must be between 7000 and 8000 feet.

(13) *Jacksonville Fault.* This great overthrust fault bounds the Jacksonville or Choccolocco Mountains on the north-west. It therefore extends from Peidmont to Oxford a distance of some 25 miles. The Weisner strata to the south-east of it can be seen in the Dark Corner to overlie the Pelham Limestones (Rockmart Slates). The vertical displacement here must be over 7000 feet. In other places along the fault, the Weisner strata overlie Siliceous (Knox) Dolomite and Chert. Near Weaver Station, there are some Cambrian strata that are believed to have been thrust over from this fault for some 3 miles towards the north-west on top of Silurian strata.

(14) *Renfro and Childersburg Fault.* This great overthrust fault with its offshoots bounds the Alpine Mountains on the north-west, the Weewoka Mountains on the south-west, the Pope Mountain on the west, and the Kahatchee Mountains on the north and east. It therefore extends from north-east of Talladega by Renfro, Alpine, and Sycamore to Childersburg, a distance of near 50 miles. Its south-west end is somewhat crescent shaped. Its greatest vertical diplacement must be something like 4000 feet.

(15) *Sulphur Springs Fault.* This fault extends from near Childersburg to the south-west and forms with its offshoots the western boundary of the Katala Mountains and also of the Sulphur Springs Mountains. It is therefore all of 20 miles long. At and near the Sulphur Springs, the Weisner strata to the east of the fault are to be seen on top of Upper Sub-carboniferous strata. The vertical displacement here must therefore be some 8000 feet.

(16) *Talladega Fault.* This great overthrust fault bounds the Talladega Slates or the Crystalline strata on the north-west. It is the south-east boundary of the Coosa Valley Region as herein discribed. It enters Alabama from Georgia in the north-east part of Cleburne county and extends as a broken crooked line to the south-west to near Randolph or to where it becomes hid or covered up by superficial unconformable Cretaceous and Tertiary strata. Its length in Alabama is therefore all of 125 miles. The Talladega Slates to the south-east of it can be seen in many places to overlie Silurian strata. Its greatest displacement, which is believed to be not over 8000 feet, is where the Crystalline strata overlie Pelham Limestones.

CONTINUITY OF STRATA.

The strata of this region in a general way are not near so continous as are those of the Tennessee Valley Region on account of their having been badly cut up by faults and washed out by denudation. They are however often continuous, mostly in narrow belts, for long distances in a general north-east and south-west direction. Another cause of the non-continuance or gradual dieing out of strata in the south-east portion of this region is the nearness of the old coast line of Paleozoic time. Owing to fluctuations in this cost line, certain strata may have never been deposited over portions of the south-east part of this region. If deposited, they were washed away from over these sections before the next succeeding strata were deposited. The nearness of the coast line would also account for the sudden varying in thickness and character of some of the strata near the south-east edge of the region and for their becoming coarser, or for the sandstones and conglomerates increasing towards the south-east. Metamorphism has also increased towards the south-east and has done a great deal towards changing the character of the strata along near the south-east edge of this region.

ENUMERATION OF FORMATIONS.

This region has some older formations and a greater variety of formations than the Tennessee Valley Region. Its formations include all of those of the south-west Appalachian system, or all of those from the earliest Cambrian to the latest Carboniferous. They are as follows:

(10) *Tertiary*	(m) *Lafayette.*	
(9) *Cretaceous*	(l) *Tuscaloosa.*	
(8) *Carboniferous*	(k) *Coal Measures*	100–5000 feet
(7) *Upper Sub-carboniferous*	(j) (1) *Bangor or Limestone phase* (2) *Oxmoore or Shale and Sandstone phase (Floyd).*	500–1800 feet
(6) *Lower Sub-carboniferous*	(i) *Fort Payne Chert*	0–350 feet
(5) *Devonian*	(h) *Black Shale*	0-200 feet
(4) *Upper Silurian*	(g) *Red Mountain Formation (Clinton)*	0–700 feet
(3) *Lower Silurian*	(f) *Pelham Limestones (Trenton, Chickamauga, Rockmart Slates)*	600–1800 feet
	(e) *Siliceous (Knox) Dolomite and Chert, (including Hayes' Upper Connesauga)*	2000–4000 feet

(2) *Cambrian*	(d) *Coosa (Flatwood) Shales, Hayes' (Connesauga)*	300–1800 feet
	(c) *Montevallo (Veriegated) Shale and Sandstone, and Aldrich Limestone. (Hayes' Lower Connesauga, Rome Formation, and Beaver Limestone)*	1200–3000 feet
	(b) *Weisner (Chilhowee) Sandstone*	2500 feet+
(1) *Crystalline*	(a) *Talladega (Ocoee) Slates.*	

GENERAL DESCRIPTION OF THE GEGLOGICAL FORMATIONS.

The distribution and comparative areas of the different geological formations can be best seen on the State Geological Map.

(1) *Crystalline*, (a) *Talladega* (*Ocoee*) *Slates*. This formation is really outside of or to the south-east of the Coosa Valley Region as herein described, or is of the Metamorphic Belt. Its north-west edge however will be considered, as this edge is mainly included in counties that with its exception are of this region. This north-west edge forms a belt of broken mountainous country that is in many places an almost uninhabited wilderness. It is bounded on the north-west by well known Paleozoic strata along the Talledega Thrust Fault and on the south-east partly by a lofty broken range of mountains. It is 100 or more miles long from north-east to south-west and, as herein considered, is from 3 to 6 miles wide from north-west to south-east. It therefore comprises some 500 square miles of territory. Its strata are sedimentary and are believed to be, partly at least, metamorphosed Cambrian rocks, because well known Cambrian strata appear to extend into their broken country and because well known

Cambrian strata just to the north-west of them are in places metamorphosed enough to look just like them. No fossils have ever been found in them and most probably never will be, because of the badly altered state of the strata. These strata are well exposed along Talladega Creek, hence the name, *Talladega Slates*.

They are semi-crystaline talcoid or hydro-mica shales with some quartzits and conglomerates and some little quartz. They are badly contorted, though they have a general north-east and south-west strike and a general south-east dip. They form prominent bluffs, ridges, and mountains, and, along all of the creeks that cross them, falls and shoals or fine water powers.

The shales vary very much in character and composition, or are much harder and more sandy in places than in others. They in bulk, especially on a fresh surface, are usually of a gray color with a greenish tint, though they are sometimes bluish and sometimes almost black. In thin scales or flakes, they usually have a silvery white, semi-talcous, semi-micaceous appearance. They are occasionally quite fissile.

The quartzites and conglomerates are much more highly developed in places than in others and much more so along the south-east edge of the belt than along the north-west edge. They make the lofty mountains that form a part of the south-east boundary. They often carry chloritic and talcose matter in their interstices, as well as veins of quartz. The quartzites are sometimes soft enough to permit of being quarried for building stones. The pebbles of the conglomerates are of rounded quartz and feldspar. They are usually small, though they sometimes get to be as large as hen eggs.

The quartz is in interstratified seams and layers of lenticular nodules. The seams are never over a foot thick, and are usually much thinner. They are sometimes gold bearing, some of them carrying visible free gold. Some of the very thin seams are rich in gold, though they are imbedded in very hard rock, and are therefore expensive to mine. Some of them have been mined at intervals for a great many years, though mainly after a primitive fashion. Some of the mines however are said to have yielded an aggregate of $100,000 or more. (See Dr. W. Taylor's report under Talladega county.) Some of these old mines, it is believed, could be now made to pay if worked with sufficient capital and after the latest improved methods. This gold and the almost untouched forests constitute the main wealth of the belt, though it has also some little limonite and some roofing slate.

(1) *Cambrian.* This group is in very irregular and dissimilar belts with a general north-east and south-west direction. According to their kind of strata, some of the belts are of broad broken mountains, some are of ridges and valleys, others are of narrow symmetrical valleys, and others still are of broad flatwoods. Those of the broad broken mountains increase towards the south-east, while the flatwood strata dimmish in this same direction. Their strata are badly folded, crumpled, and faulted, still they have a general south-east dip. These strata have a surface area of some 1150 square miles. They are of Middle and Lower Cambrian ages and of the following three formations: (d) *Coosa (Flatwood) Shales (Connesauga)*; (c) *Montevallo (Variegated) Shale and Sandstone, and Aldrich Limestone (Lower Connesauga, Rome Formation, and Beaver Limestone); and* (b) *Weisner (Chilhowee) Sandstone.*

(b) *Weisner (Chilhowee) Sandstone.* This formation is of interbedded sandy shales, sandstones, quartzites, and conglomerates. It is the great mountain making formation of this region. It makes the Weisner, Indian, Terrapin or Ladiga, Jacksonville or Choccolocco, Coldwater, Alpine or Talladega, Weewoka, Pope or Andeluvia, Kahatchee, Katala, Chalybeate and Sulphur Springs, Columbiana, etc., mountains. These mountains have been described under Natural Divisions, Chapter I. The strata of these different mountains appear to be of very variable thickness. They are all just to the south-east of thrust faults and none of them show the full thickness of their strata but they however show a maximum thickness of fully 2500 feet of strata and cover some 210 square miles of this region.

The shales are sandy and are of yellowish, pinkish, bluish, gray, greenish, orange, red, black, dove, straw and variegated colors. They are nearly always more or less metamophosed and often have a semi-talcous appearance. They are frequently knotty or curly and they sometimes carry flinty nodules.

The sandstones, flaggy and massive, are of gray, yellowish, pinkish, and greenish colors. They are frequently friable on the weathered outcrops. They are often good building stones.

The quartzites are of greenish, bluish, and gray colors. They are usually very hard and frequently have a flinty or jaspery look. The partly metamophosed rocks have often a stringy or fibrous structure, resembling somewhat old weathered bones. They often have white flint veins.

The coglomerates are usually very hard with frequently a granitic look. They are sometimes a mere mass of pebbles, though most often the pebbles are in interstartified streaks or layers. The pebbles are about the size of bird shot and sometimes so thick as to make the weathered rocks resemble a *roe*. These pebbles usually show or are opaque only on the weatherek surfaces of the rocks being translucent within and showing up sometimes as shiny bluish specks. They also appear as flattened scales in some of the more highly metamophosed strata. The conglomerates and quartzites look in many places as if they might be suitable for millstones.

Stratified limonite occurs in many places at the top of this formation. Some of the deposits are very extensive. They are however merely local in their occurrence, notwithstanding that they are regularly stratified. They take the place of ledges of quartzites and conglomerates. The ore is mainly a black waxy ore that is high in iron, silica, and phosphorus. Plate XXXIV is of one of the stratified limonite outcrops. In places, a gray magnetic ore takes the place of the limonite or is found in exactly the same geological horizon. In other places, stratified red ores and in still other places maganese and bauxite deposits are found occupying this same geological position.

(c) *Montevallo (Vareigated) Shale and Sandstone, and Aldrich Limestone. (Hayes' Lower Connesauga, Rome Formation, and Beaver Limestone).*

This formation, in a general way, increases towards the south-east. It is in long narrow irregular belts or ribbons with a general north-east and south-west direction. Many of these belts occur along the sloping south-east foot of the Weisner Quartzite mountains. They are valleys that are usually cut up by ridges. They are of shales, sandstones and limestones. They cover some 260 square miles of this region and have a combined thickness of from 1200 to 3000 feet. The strata of the most south-east belts are more or less metamorphosed.

The shales are mostly at the top of the formation. They are variegated or are of purplish, redish, yellowish, brownish, and greenish colors. They are argillaceous and doubtless below the surface are also calcareous.

The sandstones, interstratified with the shales and very variable, are mainly in the central part of the formation. They form the crests to the ridges. They are also variegated or are of many different colors. They are frequently rippled marked and are usually of a very convenient thickness for quarrying. They are fine building stones, being soft and easily cut when first quarried. Their yellowish and reddish flagstones are known in many places as *chimney rocks*, because they are used for building chimneys. These sandstones in the most south-east ridges or in the ridges next to the *Talladega Slates* are frequently metamorphosed into beautiful jasper and chalcedony. The top shales, corresponding to Hayes' Lower Connesauga, are Middle Cambrian, carrying the trilobite, *Olenoides Curticei*, and the lower shales and sandstones of the *Lower Cambrian* with an *Olenellus* zone. Interstratified with the shales and sandstones, there are in places some considerable bodies of limonite.

The *Aldrich Limestone*, the *Beaver Limestone* of Hayes, are at the bottom of the formation. They are from 300 to 500 feet thick. They are siliceous blue limestones and dolomites that are usually roughly wheathered. They are *Lower Cambrian*, and are in places full of *Salterella*. They give rise on weathering usually to a deep red fertile sandy loam. In this loam, there are many fine banks of limonite that have doubtless, in the majority of instances, at least, come from the weathering of the outcrops of the stratified seams at the top of the next underlying formation, Weisner Quartzites. Plate XXXII is of one of these limonite banks.

(d) *Coosa* (*Flatwood*) *Shales* (*Hayes' Connesauga.*)

This formation is contemporaneous with Hayes' Connesauga, as shown by fossils. Its strata are very variable. They diminish towards the south-east and south-west as the (c) Montevallo (Variegated) Shale and Sandstone formation increases. Their maximum thickness may be much greater than that given, 1800 feet. They make broad belts of flatwoods and narrow symmetrical valleys. The strata of these broad flatwoods and narrow valleys, often within a stone throw of each other, appear to be for the most part as different in thickness and character as are the flatwoods and valleys in their physical features. The yellowish shales of the red lands at the top of the Montevallo (Variegated) Shales and at the bottom of the Siliceous (Knox) Dolomite and Chert formations or Hayes' Connesauga of the narrow valleys have but a very slight resemblance to the strata of the flatwoods, though they are the same. The flatwoods and narrow valleys, however, where they occur close together are separated by big thrust faults. The flatwoods are of the more calcareous strata and to the north-west of the narrow valleys, and hence some of the difference in strata may be due to the thinning out and becoming more siliceous towards the south-east of the flatwood strata. Some of their difference may also be due to the strata of the valleys being in places, at least, partly engulfed in faults or hid by overthrust strata.

The Coosa (Flatwood) Shales as herein described are mainly of two belts, See Flatwoods under Natural Divisions, Chapter I. They also occur in many irregular narrow ribbon like strips, as on the south-east side of Murphrees Valley, and on the north-west sides of the Birmingham, Cahaba, Choccolocco, and other smaller valleys. They cover some 675 square miles of this region and are from some 300 to some 1800 feet thick. It is a very difficult matter to tell anything as to their thickness because of their crumpled, contorted, and faulted condition, and because of the similarity of the strata in their physical appearance throughout their whole thickness. Fig. 6 and Plate XXVIII serve to show how they are folded, contorted, and faulted.

These strata are of shales with interstratified limestones. The shales are finely laminated, argillaceous, and calcareous, and are principally of black, gray, and green colors, with some of yellowish, brownish and bluish colors. They carry interstratified layers of flat concretions that are usually of limy matter though occasionally of siliceous matter. The interstratified limestones are usually of a dark bluish color and in thin layers, though they are sometimes gray and sometimes massive. They are divided up by interstratified clayey seams that on the weathered surfaces are rough and usually of a dirty gray color. These seams, with the interstratified purer blue limestone, give to the weathered surfaces of the rocks a striped appearance and causes them to be called *banded rocks*. Thin shaly seams frequently take the place of the clayey seams. The limestones are also frequently full of interpolated white veins that are commonly of calcite though sometimes of siliceous matter. The limestones are also often oolitic and hard enough to take a very good polish. They frequently make cedar glades.

Some of these flatwood strata are full of Middle Cambrian fossils, *brachiopods, trilobites*, etc. They give rise to a heavy, stiff, yellowish, clay soil, with a native growth of black jacks, post oaks, red oaks, short leaf pine, loblolly pine, crab apple, etc.

(3) *Lower Silurian.*—This group is valley making in its top and bottom strata and ridge making in its middle strata. Its belts are perhaps more irregular in outlines and in topography than those of any other formations in this region. Those of the anticlinal valleys or of the north-west portion of the region are, as a general thing, narrower and of more regular outlines than those of the south-east or monoclinal portion of the region. The group covers over 1700 square miles of this region and is believed to be the thickest group of this region. Its thickness is from about 2500 to 6000 feet. It is of the two formations, (f) *Pelham (Trenton) Limestons, Chickamauga Limestones (and Rockmart Slates,) and* (e) *Siliceous (Knox) Dolomite and Chert (including Hayes' Upper Connesauga).*

(e) *Siliceous (Knox) Dolomite and Chert (including Hayes' Upper Connesauga.)*

This formation is one of the most extensive and thickest in all of the Paleozoic system. It makes most, nearly 5-7, of the area and thickness of the Lower Silurian group in this region. It therefore covers some 1500 square miles of this region. Its thickness is from about 2000 to 4000 feet. It is a difficult matter to say what is its true thickness, because of the thick covering of residual matter or because of the few exposures of bedded strata. It is of dolomites with some limestones and a great deal of chert and, at its top and bottom, some sandstones, conglomerates, and breccia. Its upper strata are ridge making and its lower strata are valley making. Sink holes are characteristic of it.

The dolomites are usually massive bedded, coarse grained, and more or less crystalline. They are however often fine grained compact rocks like lithographic stones. They are most commonly of a light gray color, though they vary in color from an almost white to a dark blue. They are usually siliceous and unevenly weathered. The weathered surfaces are often hacked and covered with a coating of coarse white sand of a sugary appearance. The lower strata however are in places very pure dolomites, carrying less than 1% of silica. These lower purer strata are usually covered by a deep red loam. They are included in Hayes' Connesauga.

The chert is in interstratified layers of nodules and in interstratified seams. It is most commonly the main rock of the upper part of the formation. It forms a broken country of irregular rounded and knobby hills and ridges in no regular order and covered deeply with loose cherty nodules. These cherty nodules are often oolitic and concretionary. They sometimes become on weathering of a chalky whiteness and sometimes full of pores or geodes that are lined with quartz crystals.

The sandstones, conglomerates, and breccia at the top and bottom of the formation are local in their occurrence. The sandstones and finer conglomerates occur at the bottom of the formation, while the coarser conglomerates and breccia are to be fouud at the top. They are all massive, still they are not very thick and do not cover much surface area. The sandstones and conglomerates at the top of the formation in their weathered or leached outcrops are of coarse shining sand crystals and are very porous or full of holes. They are calcareous below the surface. The matrix is commonly red or ferruginous and micaceuos. The pebbles, of bird shot size, of rounded angular chert and flint, are uniformly distributed through the rocks.

The coarser conglomerate at the top of the formation are of rounded angular cherty nodules and boulders from the size of a marble to that of a barrel. They are often nothing more than pudding-stones, the cementing matrix of yellow and red ferruginous sandstone, or siliceous matter, being hardly enough to hold together the rounded nodules and boulders.

The breccia is of cherty and sandstone fragments in a cherty or sandstone matrix. The fragments vary in size from small nodules to several tons. They sometines have their edges more or less rounded. Those of sandstone have white cherty splotches. The matrix is frequently barely enough to hold the fragments together. This breccia often has in its weathered surfaces pores or empty pockets, from the weathering out of the fragments. It and the coarse conglomerates have been seen in bluffs of some 50 feet in height.

This formation, as herein considered, is mostly Lower Silurian, though it is partly Middle Cambrian. It is so sparingly fossiliferous, however, that the exact position of the dividing line between these two periods is in doubt,

This formation is one of the main limonite bearing formations of the State. Plates VII, XVI, XVII, XXIX, XXX, and XXXIII are of its limonite banks. It also has the principal bauxite, barite, and tripoli or polishing powder of the State, and many fine banks of porcelain and refractory clays. Plate XVIII and Figures 15, 16 and 18 are of its bauxite banks. Its purer dolomites are used extensively for fluxing purposes. Plates XIX and XXI are of its flux quarries.

The purer dolomites near the bottom of the group usually give rise to a deep red fertile sandy loam that makes perhaps the best farming land of this region.

For a general description of these red lands and of the cherty ridges of this formation, see respectively, *Irregular valleys with jagged edges* and *Chert hills and ridges*, under *Natural Divisions*, *Chapter I*.

(f) *Pelham Limestones (Trenton), Hayes Chickamauga Limestone and Rockmart Slate.*

This formation is valley making, though it occasionally makes conical hills that are covered with cedar. Its valleys, when it is not partly engulfed in faults, are usually symmetrical. It makes the inner fluting valleys of the anticlinal valleys. It is more engulfed by faults than any other formation of this region. This is because its strata are comparatively soft and easily sheared off in faults. It is therefore very commonly in conjunction with or is partly engulfed in a fault on one side or the other. It however covers over 300 square miles of this region and is from 600 to 1800 feet thick. It is made up for the most part of limestones with calcareous shales in the north-west half of the region and of clayey shales and slates with interbedded limestones in the south-east half. The change from calcareous strata on the north-west to clayey shales on the south-east is gradual. Its valleys are long and narrow and have a general north-east and south-west trend.

The limestones are mostly blue though they are often gray. They are usually quite pure, and are used extensively for lime burning and fluxing, notwithstanding that on the weathered surfaces they are often banded and splotched as if by clayey seams. Plate XX and XXXI are of fluxing quarries in them. Their surfaces are frequently also unequally weathered into furrows and ridges. Some of the more clayey of them on weathering break up into irregular lumps while others become shaly. They frequently carry calcite veins. The upper and lower strata have often greenish splotches and cherty nodules, and in places some variegated strata that are called *calico rocks*. These variegated rocks and others of the group are in places very good marbles.

The clayey slates of the south-east half of the region in places along their south-east edge or next to the metamorphosed strata have a very good cleavage and are tough enough to make very good roofing slates. These slates however, in many places, are badly cut up by vertical joints.

The calcareous strata of the north-west half of the region are very fossiliferous; the upper strata, especially the shales, abounding in *graptolites* and the lower massive rocks in *maclurea magna*. The strata however become less fossiliferous as they become clayey towards the south-east and so the clayey shales and slates of the south-east half of the region are almost if not wholy barren of fossils, though the interbedded limestones are fossiliferous.

(4) *Upper Silurian*, (g) *Red Mountain Formation* (*Clinton, Rockwood*).

This is a mountain making formation, though it is not so persistent as the underlying valley making formation. It does not cover a great deal of surface area because its outcrops are mainly on steep hill sides. It is also variable in the thickness and compositon of its strata. In a general way, it feathers out and becomes more sandy towards the south-east and also more gradually towards the south-west. Along its south-east edge, it is local in its occurance or is not continuous but merely in patches along the strike. It covers about 140 square miles of this region and is from 0 to about 700 feet thick. It is made up of shales, sandstones, conglomerates, limestones, and red iron ores. The limestones and ores however occur only in the north-west half of the region, the whole formation giving out in the south-east half of the region. The shales become more sandy towards the south-east and the sandstones coarser and harder, becoming in places a quartzite in this same direction. They are both of many colors. The conglomerates increase in comparative thickness and coarseness towards the south-east. The limestones are thin bedded. They do not extend farther to the south-east than Shinbone Ridge and Little Mountain along the south-east edge of Lookout Mountain and do not cross to south-east of the great body of flatwoods along the Coosa River. The red ores extend as far to the south-east as Colvin, Green Creek, and Beaver Creek mountains, to the north-west of the north-east end of the Coosa Coal Field. Some few loose pieces of ore however have been seen still farther to the south-east.

This red ore occurs in the red mountains on both sides of Wills, Murphrees, and Birmingham valleys, in the red mountain to the south-east of Blount and Chandler mountains, in Little Mountain and Shinbone Ridge, in Dirt Seller Mountain and in Colvin, Green Creek and Beaver Creek mountains. The red mountains however on the north-west sides of the Wills and Birmingham valleys and on the south-east side of the Murphrees valley, are partly engulfed in faults. The ore over most of its outcrops however is not workable, because either of its thinness or poor quality. It is in from 1 to 5 different seams. It is most highly developed in East Red Mountain between Birmingham and Bessemer, where the workable or better class of ores are in three different seams. One of these seams has a maximum thickness of 33 feet; two of them come together opposite Birmingham; and the middle or big one, the Red Mountain Seam, splits into two seams or benches towards the south-west. This Red Mountain Seam has been surface dug all the way from Birminham to Bessemer with the exception of perhaps ½ mile. It also has between these two points 25 well developed underground mines. Plates XV, XXIII, XXIV, XXV, and XXVI are of some of its mines.

This red ore is being mined also in East Red Mountain to the north-east of Birmingham and in the East Red Mountain of Wills Valley, and in Little Mountain to the south-east of Lookout Mountain. It has also been mined in McAshan Mountain, in the West Red Mountain of Murphrees Valley, in the red mountain to the east of Blount Mountain, and in Dirt Seller Mountain. It is the main dependence of the coke furnaces or of most of the furnaces of Alabama.

The sandstones are in many places good building stones, and the flagstones, beautifully ripple-marked and of very uniform thickness, are good paving and curbing stones.

(5) *Devonian*, (h) *Black Shale*.—(Chattanooga Shale of Hayes').

This formation has but very little effect on the topographical features and covers but very little of the surface area of the region, as it is thin and confined almost exclusively to hill sides and as it easily breaks down or crumbles on weathering. It feathers out to the south-east and may be said not to occur in the monoclinal portion of the region or to the south-east of the Coosa River and Cahaba Coal Field. Its thickness is from 0 to about 200 feet, though its usual thickness is less than 20 feet. Fig. 4 Part I is a sketch of its outcrop in an old quarry. It is made up of a black shale with some dark gray sandstones and of a bluish gray shale. The black shale is a bituminous carbonaceous shale. It is tough and bituminous enough to burn or blaze up when thrown into a hot fire. It is less bituminous,as a general thing, in its upper than in its lower strata. It could be made to yield on distillation a heavy lubricating oil. The sandstones are for the most part thin bedded and in the lower part of the formation. They as a whole are from a few inches to some 15 feet thick. They are bituminous, carbonaceous, fetid, fine grain rocks. They are sometimes full of a small fossil, *lingula*. The bluish gray shale occurs at the top and bottom of the formation. It is an argillaceous shale that is local in its occurence and never over a few feet thick.

This formation usually has all through it more or less iron pyrite in small balls, sheets, and grains. This mineral is the *ignis fatuus* of the mineral hunter and is the source of the sulphur and chalybeate springs of the country.

(6.) *Lower Sub-carboniferous*, (i) *Fort Payne Chert.*

This formation, as it has become much more cherty in its upper strata, can not here, as in the Tennessee Valley Region, be divided into two sub-formations by the physical and geological features. The large coral, *lithostrotion canadense*, that is characteristic of the less siliceous or upper beds (Tuscumbia Limestones or red lands) in the Tennessee Valley Region is here found away down in the cherty strata. The formation is ridge making, and so its outcrops are confined to the tops and sloping sides of ridges. It is therefore in irregular long narrow belts with a general north-east and south-west trend. It feathers out towards the south-east and is in places along near the south-east edge of the region entirely wanting. It also varies very much in thickness in the direction of the strike. It covers over 250 square miles of the region and is from 0 to some 300 feet thick,

It is made up of chert and siliceous limestone with some shales and sandstones. The chert is the main rock of the formation. It is in stratified seams from the fraction of an inch to some two feet in thickness. Its strata are sometimes a mere mass of crinoidal stems. It alternates with the other strata. It sometimes weathers into beds of a harsh pulverulent white and yellowish substance that is called *chalk*. This chalk is a very good polishing powder. The siliceous limestones, especially in the upper strata, have isolated cherty nodules imbedded in them to a greater or less extent. They too are frequently full of crinoidal stems. The shale is sometimes a greenish calcareous argillaceous shale and sometimes a fetid bluish calcareous siliceous shale. It is most abundant in the lower part of the formation, though it alternates higher up with the chert. The sandstones occur in only a few places and are thin and limited in their extent. They are pale yellowish and grayish rocks that are porous and soft enough when first quarried to be easily cut or sawed.

Limonite occurs in stratified seams in the upper and lower strata of this formation. It is local in its occurence being much more highly developed in places than in others. Along its outcrops, there are some extensive deposits of loose boulder, nodular, and gravelly ore that has doubtless come from the weathering and breaking down of the outcrops of the stratified seams. This ore is in places too siliceous or cherty to be of value, though in other places it is of fine quality.

Manganese ore also occurs in the upper and lower part of this formation or at the same geological horizons as the limonite. One of these deposits is perhaps the largest known of in the State. Banks of fine pottery clay with some irregular pockets of siliceous or fire clay and considerable beautiful halloysite, in seams and nodules, also occur in the lower strata of this formation. This clay has been extensively mined and used.

(7.) *Upper Sub-carboniferous.*—This formation is of two contemporaneous phases, the (1) *Bangor or Limestone phase* and the (2) *Oxmoor or Shale and Sandstone phase.* The first of these, the only phase of the Tennessee Valley Region, does not occur in this region however, except along the north-west edge or in Wills and Murphrees valleys.

This formation, as a whole, is valley making, though it becomes less and less so and the valleys become more and more broken towards the south-east and south-west as the (1) Bangor or Limestone phase gives way to the (2) Oxmoor or Shale and Sandstone phase or as the strata become more and more siliceous. The strata are variable in thickness as well as composition, though they, in a general way, appear also to thicken towards the south-east and south-west. The strata of the (2) Oxmoor or Shale and Sandstone phase or those of the south-east portion of the region are so badly contorted and faulted as to make it almost impossible to tell about their thickness. They however, with a steep south-east dip, cover broad areas and are believed to reach a thickness of all of 1800 feet, the minimum thickness being some 500 feet. The formation covers some 275 square miles of the region.

The (1) *Bangor or Limestone phase* is this region, is confined to comparatively narrow valleys. The most of its outcrops, being under a protecting cover of hard sandstones and conglomerates of the Coal Measures, are on steep mountain sides. Its strata are of gray and blue limestones with some interstratified shales and sandstones. The limestones are for the most part quite pure, though some of them are hard and siliceous and some are cherty. They have been mined extensively for fluxing purposes. Plates II and IX are of its fluxing quarries. The shales are interstatified with the limestones. They are principally calcareous, though some of them are argillaceous. They are of grayish, bluish, and variegated colors. The sandstone of this phase is very variable in thickness and character. It appears to be wanting in many places. It occurs at the bottom of the formation and, as a general thing, is thin bedded and a good building stone. Plate V is of a quarry in it. It is also shown in Plate VIII and Fig. 7.

The (2) *Oxmoor or Shale and Sandstone phase, Hayes' Floyd Shale*, makes some broad broken very irregular piney woods sections or valleys with a general north-east and south-west direction. The principal of these sections or valleys are the one just to the north-west of the Cahaba Coal field and the one just to the south-east of the Coosa Coal field. It also forms a broken valley along the south-east edge of Lookout Mountain and one along the north-west edge of the Coosa Coal Field, and an isolated tract in the Dirt Seller synclinal and an other just to the west of the Talladega Springs. It is of shales and sandstones with some interbedded limestones. Its shales, the principal strata, are much more highly developed in places than in others. They are hard black and yellow siliceous shales. The black shales are sometimes carbonaceous enough to be taken by the inexperienced for stone coal. These shales have a great deal of calcareous matter disseminated through them in white streaks and specks and flattened masses. They are curly and, so far as seen, non-fossiliferous, though the interbedded limestones are usually full of fossils. The sandstones are interstratified with the shales. They are very variable in their occurrence. They are hard and often flinty looking with shining quartz crystals over their surfaces. They are of white, orange, and yellow colors, and are for the most part thin bedded or flaggy. The limestones are merely in patches in the shales, in interstratified seams and in layers of boulders and nodules. They are very variable. The same boulder is sometimes partly a limestone and partly a sandstone. They are usually full of calcite streaks and of fossils. The fossils in the most south-east or metamorphosed strata are frequently nothing more than white calcite specks.

(8.) *Carboniferous*, (*k*) *Coal Measures.*—This formation is the most extensive of the Paleozoic strata in Alabama. It is in three different fields that are called the Warrior, Cahaba, and Coosa coal fields from the names of the respective rivers which drain them. Their combined area in Alabama is something over 8,000 square miles. This region comprises over one-half of their area or some 4,800 square miles and all of their thicker measures. It comprises in the Warrior Field, parts of Raccoon and Sand mountains, all of Lookout and Blount mountains, and all of the Basin Area, or some 3,800 square miles. It includes all the Cahaba Field about 430 square miles, and all of the Coosa Field about 250 square miles. The maximum thickness of the measures is different in the different fields. It is believed to be greatest along the south-east edge of the Cahaba Field where, according to Mr. Joseph Squire, it is about 5,450 feet, though Mr. A. M. Gibson makes the Coosa Field to have measures some 5,750 feet thick. The thickest measures of the Warrior Field are something less than 5,000 feet.

The strata are of shales, sandstones, conglomerates, and stone coal. They become coarser or the sandstones and conglomerates increase towards the south-east. The shales are nearly all arenaceous. They are of grayish, yellowish, orange, blackish, and bluish colors. They give rise to a sandy loam that is easily washed. The underbed to nearly all of the coal seams, however is a very fossiliferous argillaceous bluish shale, that on weathering gives rise to a plastic clay well suited for ordinary pottery, and as a matrix in the manufacture of fire bricks. The sandstones of gray, orange, and yellowish colors are mostly thin bedded. Their flags have smooth, or rippled marked sides and sometimes are thin and uniform enough to be called *plank rocks*. They are fine for paving and curbing purposes. The more massive rocks are frequently good building stones. The conglomerates are principally in the upper and lower parts of the measures. They are especially massive in the south-east field or in the Coosa Field. Their pebbles are of small well rounded flint, except in some of the conglomerates near the top of the measures where they in places get to be the size of hen eggs. The coals are all soft or bituminous. They comprise good coking, blacksmithing, steam, gas, and grate coals. Many of them, firm and bright, are hard enough to well bear transportation, while others are of a duller color and of a softer and more friable nature. They are in seams that vary in thickness in the same field and in number in the different fields. The seams are most numerous and have the greatest combined thickness along the south-east edge of the Cahaba Field where the measures are believed to be thickest and where, according to Mr. Joseph Squire, there are about 50 different seams with a combined thickness of coal of from about 70 to over 100 feet. Plate XXVII. illustrates the thickest of these coal seams on the outcrop. The Warrior Field has about 35 different seams with a combined thickness of coal that varies from about 25 to 90 feet. Plate XXII. is a flash light view at the head of a slope in one of the thickest of the coal seams of the Warrior Field. The Coosa Field, according to Mr. A. M. Gibson, has at least 16 known seams with a combined thickness of coal of over 50 feet.

These measures have also some black band iron ore in several seams,and some clay iron stone in interstratified bands and as layers of nodules, balls, and kidney-shape concretions, and some limonite in a stratified seam near the bottom of the formation that is believed to be an altered carbonate.

These measures in places are covered with a fine growth of long and short leaf pine and in other places, along the water courses, of oaks, gum, beech, poplar and cypress.

(9.) *Cretaceous*, (*l*) *Tuscaloosa*, *and* (10) *Tertiary*, (*m*) *Lafayette*.—A description of these formations does not properly come in this report on the Paleozoic strata, but as they solidly cover the Paleozoic strata on the south-west, and occur in patches over the Paleozoic strata for a long ways to the north-east of their solid bodies, they will be briefly considered. Some of their strata are so much alike as to often make it a difficult matter to tell the two formations apart. They are of sandy loams, sands, water worn pebbles, and clays. Their loams, sands, and clays are of various colors, the former two being micaceous.

In the case of the Tuscaloosa formation, the sands are often cross-bedded, the clays are sometimes stratified and sometimes very tough, and laminated, and the pebbles are principally of small angular chert. The clays are extensively mined for fire bricks. The tough laminated clays are fine potter's clays.

In case of the Lafayette formation, the sands are usually stained with iron, the pebbles are mostly of well rounded quartz, and the clays, in very limited quantities, are usually plastic. Many fine limonite deposits are of this age, though their iron has been derived from Paleozoic strata either underlying the deposits or close by.

CHAPTER III.

MINERALS, ROCKS, AND OTHER SUBSTANCES OF SPECIAL USE AND INTEREST.

The mineral resources of this region are great and varied. It, with the Metamorphic belt, to the south-east might with a good deal of propriety be called the mineral repository of the State. It includes in very large quantities, and of good quality some of the most important of all mineral substances. The importance and value of any mineral substance is strictly dependent on its quality, quantity, and accessibility. The chief or most valuable mineral substances of this region are *stone coal*, *iron ore*, *aluminum minerals* (*bauxite and clay*), *barite*, *manganese ore*, *lead ore*, *gold*, *marble*, *buiding stones*, *paving stones*, *curbing stones*, *slates*, *millstones*, *grindstones*, *whetstones*, *lithographic stones*, *road and ballast materials*, *hydraulic cement rocks*, *minerals paint*, *tripoli or polishing powder*, *sands*, *mineral waters*, etc.

STONE COAL.

Stone Coal is by far the most important of all mineral substances when in sufficient quantity and of good quality. It is especially the most important of all the mineral substances of this region because of its quantity and quality. Of its vast supply in Alabama, there is but little, comparatively speaking, outside of this region in seams that are workable or are 2 feet and over in thickness. The coal seams of this region however are not only variable in thickness but some of them are also merely local in occurrence. They range in thickness from 0 to over 9 feet. The thicker seams in places, in the troughs of waves, bulge out to 17 and 18 feet in thicknesss. Those in the Warrior Field, are about 35 in number, with a combined thickness of from 25 to 90 feet of coal. Of these 35 seams, about 20 are in places 2 feet and over each in thickness; of these 20 seams, some 14 are, in places, 3 feet and over each in thickness, and of these 14 seams some 7 are in places 4 feet and over each in thickness. The accompanying Plate XII is a flash light view of one of the thickest of these seams at the head of a slope. In the Cahaba Coal Field, according to the report of Mr. Joseph Squire, there are about 50 different seams of coal with a combined thickness of from about 70 to over 100 feet of coal. Of these 50 seams 23 are in places 2 feet and over each in thickness; of these 23 seams 16 are in places 3 feet and over each in thickness; and of these 16 seams 8 are in places 4 feet and over each in thickness. Plate XXVII is a photograph of the thickest of these seams on an out crop. In the Coosa Field, according to the report of Mr. A. M. Gibson, there are in the *Fairview Section* 16 different seams of coal, of which 8 are 2 feet 6 inches and over each in thickness, and 7 of these 8 seams are between 3 feet and 4 feet 4 inches each in thickness. In the *Coal City Basin*, he says, there are 12 different coal seams that are between 3 and 6 feet each in thickness, besides numerous thin seams. These 12 seams he reports as carrying about 50 feet in thickness of coal

Some of the coals of this region have a vertical flaggy structure or a regular *face and butt* structure, while others are divided up by joints into cubical and rhomboidal blocks and others still are devoid of any regular forms, or are solid and compact throughout. Some of them on exposure to the weather quickly crumble while others do not seem to the naked eye to be affected after

18 ft
17 ft
12 ft

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years of exposure. Some of them have considerable mineral charcoal, principally in thin sheets along the planes of stratification, and some of them have but very little ash and clinker, while others are bony and shaly. The thicker seams carry interstratified thin slate partings that cannot be mined out cleanly. The coals of the thicker seams ought therefore, when possible, be crushed, washed, and converted into coke. Crushing the coal alone is seemingly an advantage in that it appears to make the coke stronger and more uniform.

The coal industry in Alabama or in this region has increased most rapidly within the last 20 years. The total coal out put for the State in 1872 was not over 10,000 tons, in 1875 it was not over 60,000 tons, while in 1895 it was over 5,700,000 tons, placing the State fifth in the list of coal producing states. The following table of coal product in this region for 1893 and 1894 is compiled from tables in Part IV, Mineral Resources of the United States, 1894.

YEAR.	Loaded at mines for shipment. Short tons.	Sold to local trade and used by employés. Short tons.	Used at mines for steam and heat. Short tons.	Made into coke. Short tons.	Total Product. Short tons.
1893	3,536,935	59,599	96,412	1,443,989	5,136,935
1894	3,269,548	43,911	130,404	953,315	4,397,178

YEAR.	Total value.	Average price per ton.	Average number of days.	Total number of employés.
1893	$ 5,096,792	$ 0.99	237	11,294
1894	$ 4,085,535	$ 0.93	238	10,859

The reduction in 1894 below that of 1893 is said to have been due to a general depression of business and strikes throughout the United States.

The State Mine Inspector in his report for 1895 gives the names of 85 well developed mines in the coal fields of this region with a total output of coal for 1895 of 5,705,579 short tons, the greatest that has ever been. Of this total output 1,107,335 tons were lump; 111,065 nut; 1,232,734 slack; and 1,107,335 the run of mines. Of the 85 mines, 72 with an output for 1895 of 4,933,841 tons, are in the Warrior Field; 11 with an output of 716,066 tons are in the Cahaba Field; and 2 with an output of 30,806 tons are in the Coosa Field. The 72 mines of the Warrior Field are in 6 different seams, the 11 of the Cahaba Field are in 5 different seams, and the 2 of the Coosa Field are in different seams. Most or nearly 4-5 of the total coal output of the region however is from only 2 seams, the Pratt and Mt Carmel of the Warrior Field. The Pratt seam nearly 4 feet thick with its 34 mines furnished 3,263,756 tons and the Mt Carmel seam about 6 feet thick with its 23 mines furnished 1,146,913 tons of the total output for 1895. *

The coals of this region are used for coking, blacksmithing, steam, gas, and domestic purposes. Over 2,700,000 short tons of the output for 1895 were converted into coke, the coke output for 1895, being 1,600,978 tons, or about 10 per cent. of the coke made in the United States. This production, by far the greatest in the history of the State, is believed to place Alabama again ahead of West Virginia and next to Pennsylvania in the list of coke producing States. * * The coke output for Alabama in 1880 was only 60,781 short

* The total coal output of the State for 1896 is even greater than that for 1895, notwithstanding many unfavorable conditions for 1896. This total output for 1896 is given by the State Mine Inspector at 5,743,679 tons.

* * The coke production of the State for 1896 is estimated by the State Mine Inspector at nearly 100,000 tons greater than that for 1895 or at 1,689,407 tons

tons. The following table of the manufacture of coke in Alabama in 1893 and 1894 is compilled from tables in Part IV, Mineral Resources of the United States 1894:

YEAR.	Establishments.	Ovens.		Coal used, short tons.			
				Run of mine.		Slack.	
		Built.	Building.	Unwashed.	Washed	Unwashed.	Washed
1892	20	5,320	80	2,463,866	0	11,100	111,500
1893	23	5,548	60	1,246,307	51,163	292,198	425,730
1894	28	5,551	50	411,097	7,429	477,820	677,899

YEAR.	Yield of coal in coke.	Coke produced Short tons.	Total value of coke.	Value of coke per ton.
1892	58%	1,501,571	$ 3,464,623	$ 2.31
1893	58%	1,168,085	$ 2,648,632	$ 2.27
1894	58.7%	923,817	$ 1,871,348	$ 2.025

The falling off in coke production in 1894 below that of 1893 was due to a depression in the iron business or to a falling off in the pig iron production, the main consumer of the coke made in Aladama. All of the 1895 coke was made of coals from the Warrior Field with the exception of 168,196 short tons that was made of the coals from the Cahaba Field, and all of it with the exception of 216,010 short tons was made of the coals from two seams, the Pratt and Mt Carmel.

The above coke was all made in bee-hive ovens with a complete loss of all the by-products, with the exceptof some little of the waste gas that was used for fuel, under boilers. The chief by-products in coke manufacture are coaltar, benzole, and sulphate of ammonia, and the complete loss of them, where the coke output is such as it is in Alabama, is indeed a serious consideration.

This great loss it is fondly hoped will soon be partly, at least, stopped in Alabama. To give an idea of the great waste that is thus going on around us in the coke production, the following extract is taken from an article on the "Utilization of By-products from Coke Ovens" by Col. W. J. Montgomery, read before the Alabama Industrial and Scientiffic Society, in 1895:

"From the actual experience of the Birmingham Gas Company, we can safely count on 8000 cubic feet of gas, about 8 gallons of tar, 20 to 24 pounds of sulphate of ammonia, and 2 gallons of benzole per ton of coal carbonized."

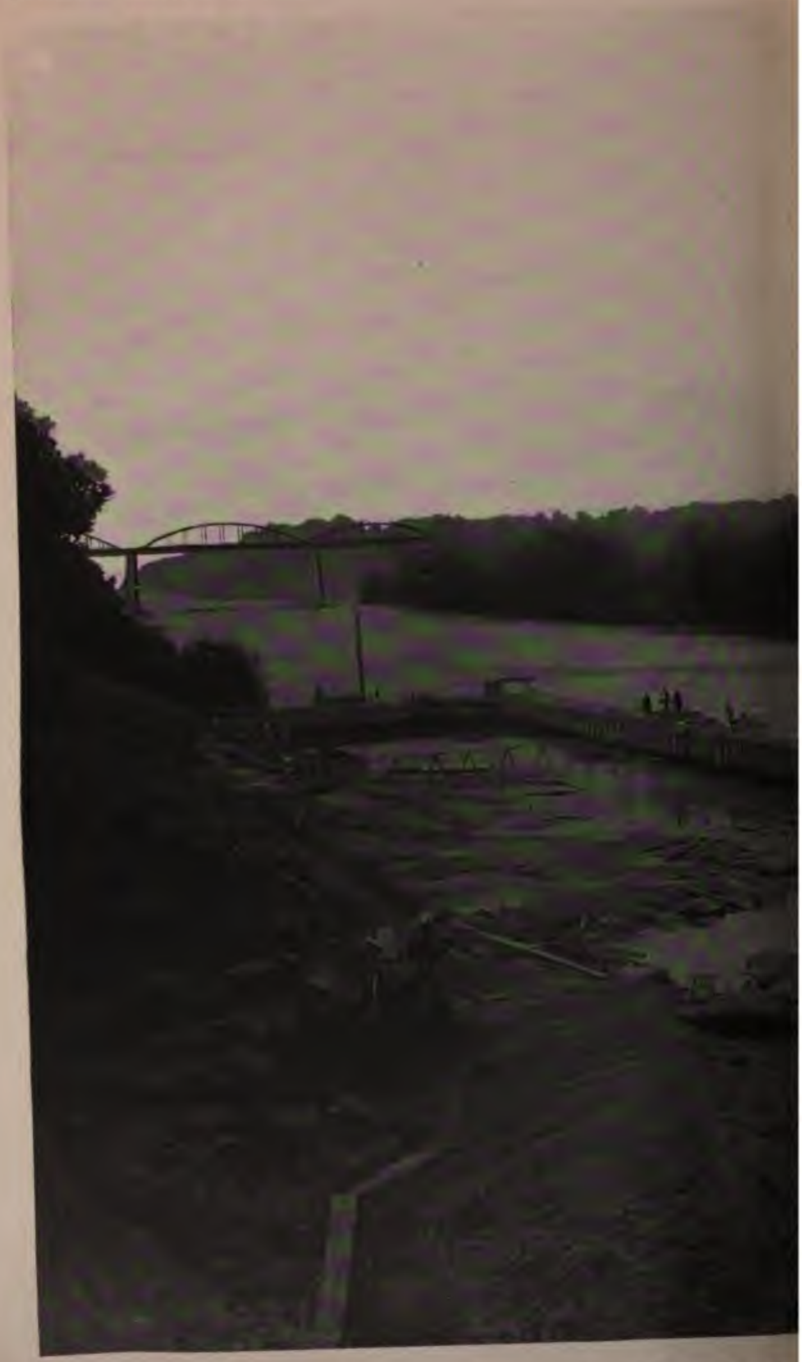
"In the year 1892, the product of the coke ovens of Alabama was about 1,500,000 tons, sold at $2.30=$3,450,000: consuming about 2,500,000 tons of coal. If this coal had been coked in retort ovens, the product would have been something like the following:

2,000,000 tons of coke....	@$2 30..	$4,600,000
500,000 bbls. of coal tar.	@$1.50..	750,000
20,000 tons of sulphate of ammonia.................	@$50.00.	1,200,000
4,000,000 gals. of benzole..	@ 15cts	600,000
Total product......................		$7,150,000

With an additional 8,000,000,000 cubic feet of gas to be utilized.

To do this, however, would require an expenditure of something like $4,500,000 for new ovens, and abandonment of the present ovens, which have cost us about $ 1,600,000, or a total investment of about $6,100,000. As you will see, in this State alone, about $3,700,000 went up in smoke."

Official tests for steaming purposes were made on the U. S. S. Montgomery cruising in the Gulf of Mexico,



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SCALOOSA, ALABAMA.

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in 1895, of some half dozen of these coals with very favorable results, especially in the case of some of them. Some of them were officially tested and shown at the same time to be also fine for blacksmithing purposes.

The use of the coals of this region will be greatly extended, it is hoped, by the completion of the improvements on the Warrior River, by the United States Government, of dams and locks for slack water navigation. The three locks that were necessary to overcome the University Shoals have been completed and boats with coal barges in tow are now passing through them. These shoals,of conglomerates and sandstones near the top ofthe Coal Measures, are the first rocky obstructions to navigation in the Warrior River and are the most south-west visible Appalachian strata. The foot of these shoals or the most south-western visible Appalachian strata and the coffer-dam of Lock No. 1, the lowest one down the river, is shown in the accompanying Plate XIII.

IRON ORES.

The iron ore industry in Alabama has made wonderful progress within the last few years. Alabama did not take a prominent position in the list of iron ore producing states until 1889 when she jumped to second place, being next to Michigan. She held this second place up to 1894 when there was a decrease in her iron ore production and she was turned down by Minnesota. She still holds third place in the list. Unlike, however, the two states that rank her in iron ore production she smelts almost all her ores instead of shipping them to other states to be smelted. She is now fourth in the list of States in pig iron production and stands a good chance of being second within a year or two. She has 34 coke furnaces,and 12 charcoal furnaces that during 1895 had an output of 854,667 long tons and during 1896, had an output of 922,170 long tons of pig iron. She had invested in iron ore mining in 1880 only about $40,000 while in 1890 this invesment amounted to $5, 244,906. Her iron ore production for 1894 according to Part IV, Mineral Resources of the United States, 1894, was 12.57% of all the iron ores produced in the United States or 1,493,086 long tons with a value of $1,240,895 at $0.83 per long ton. The greatest drawback to the production of iron ores in this district is that they are too high in phosphorus, as a general thing, to make Bessemer steel, for which purpose heretofore much more than half of the pig iron made in the United States has been used, and hence the pig iron of these ores has heretofore been restricted in their use, for the most part, to foundry, mill, and pipe purposes. These ores of Alabama in this region are now making 35% of the iron used in the foundry, mill, and pipe works. They are now also making a very low silicon or basic pig iron for the steel open hearth plants. It is very gratifying to know that the output of the basic pig iron is increasing rapidly and steadily as the Bessemer pig is decreasing and that an other outlet is thus given to our iron ores.

An other drawback to the production of iron ores in this region is the want of a near market for the pig iron, the long haul necessary to get the product to the consumers of course adding greatly to the cost of production. This drawback, however, can be overcome and it is hoped that it will be with the renewal of prosperous times. Notwithstanding these great disadvantages, Alabama, since she is able to make pig iron cheaper than any other portion of the United States, can successfully meet all competition even in the far away markets. During 1895, according to W. B. Phillips, pig iron was made in Alabama at less than $6.00 per ton. The iron ores of this region therefore owe much of their importance to their most favorable location with respect to the other raw materials for the manufacture of iron.

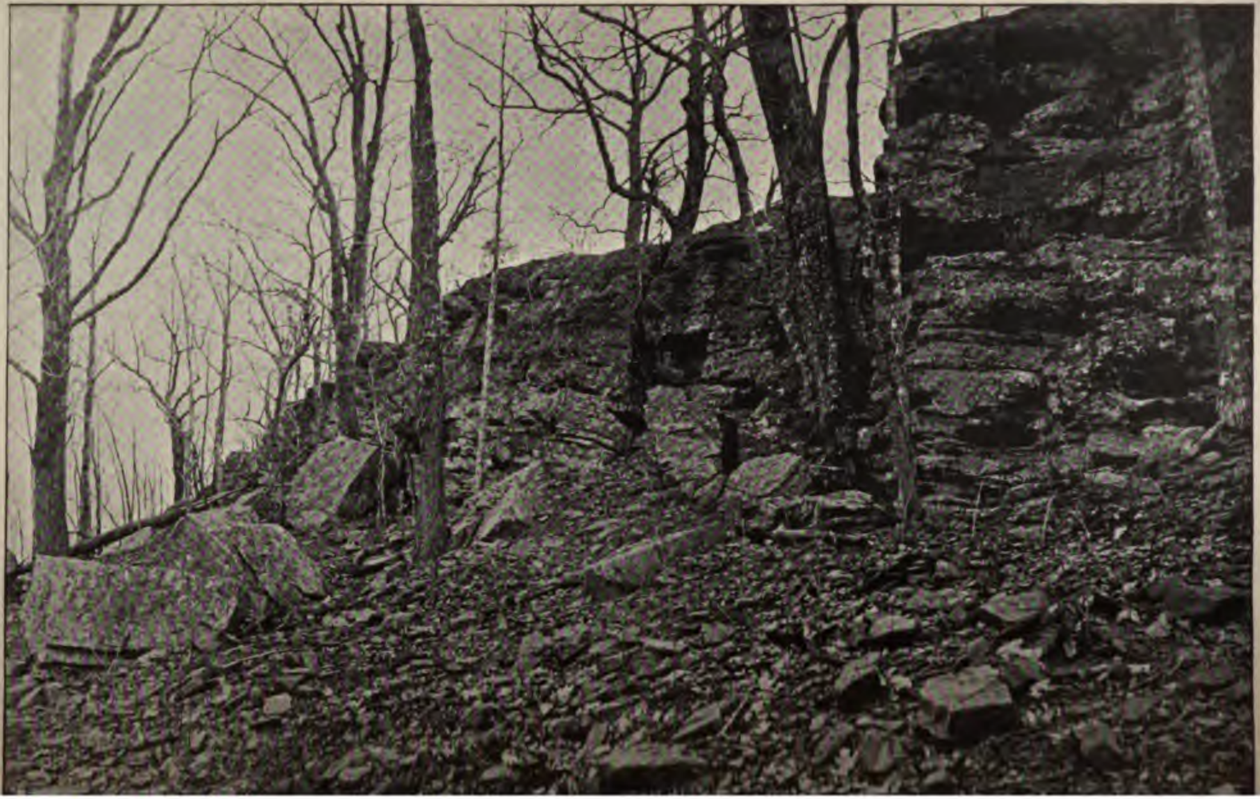
Iron ores, when in sufficient quantity and of good quality, are of all mineral substances next in importance to stone coal. The ores of this region are in sufficient quantity and of good enough quality for all purposes except the Bessemer steel manufacture. The quantity can not be estimated with any close approximation because of the irregular occurence of a good portion of the ores. It can be said, however, that those ores which are regular in their occurrence are in sufficient quantity to last for an indefinite number of years at the present rate of consumption. The iron ores of this region so far as their economic values are concerned, are mainly of only two kinds, namely: *Red Ore* or *Hematite* and *Brown Ore* or *Limonite*. This region, however, has some *black band* ore and *clay ironstone*, and some *gray* or *magnetic ore*, and some *pyrite*.

Red Ore or *Hematite*, also called *Clinton Ore*, *Dyestone Ore*, *Fossiliferous Ore*, *Lenticular Ore*, *Oolitic Ore*, etc., is by far the most important of the iron ores of this region, because of its quantity, mode of occurrence or reliability, cheapness with which it can be mined, and close proximity to the other raw materials for the manufacture of iron, i. e., to the coals and fluxing rocks. It is not very rich in iron but because of its great advantages, its development has been remarkable. It was not used any until 1876, but in 1894 it supplied 79.19 per cent. of all the iron ore that was mined in the State or 1,182,362 long tons. This output placed the State third in the list of red ore producing states. Some of its mines are among the largest iron ore mines in the United States.

This ore occurs in the red mountains, in the (g) Red Mountain formation, that flank the narrow anticlinal valleys between the coal fields. It is in from 1 to 5 regular stratified seams that range in thickness from a few inches to 33 feet. The accompanying Plate XIV illustrates an outcropping of the thickest of these seams. These seams though they vary from place to place in thickness and quality of ore, can be relied on with a very great degree of certainty at any one place as to the quantity and quality of their ores. Knowing the quantity, quality and manner of occurrence of the ore, the best methods for mining it can be selected and fair estimates can be made as the outlay that the ore will justify in order to mine it with the greatest ease and profit. The ore, being in thick seams and so lying as to permit greatly of the use of gravity in most instances in the mining of it, can be most easily and cheaply mined. During a part of 1895, this ore with 46 per cent. of iron, was delivered in the stock houses at 50 cents per ton. Its formation immediatly overlies a limestone that is extensively used as its flux. The other fluxing rocks, limestones and dolomites, of the narrow valleys are along the edges of the valleys, immediately under the Coal Measures, and along the valleys midway between the East and West red mountains. So all the raw materials for the manufacture of iron on any scale, the iron ores, coals, and fluxing rocks, are to be found here within a few miles. The greatest haul in this region of any raw material used in the iron production is not over 100 miles.

Without any respect to its hardness or solidity. The

GEOLOGICAL SURVEY OF ALABAMA. VALLEY REGIONS REPORT, PLATE XIV.



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term *soft ore* is applied to the leached ore or to the ore with no lime, or very little lime in it, and the term *hard ore* to the unleached or limy ore with 15% to 20% of lime in it. The *soft ore* carries from 45% to 50% of metallic iron and from 18% to 20% of silica, and the *hard ore* from 35% to 40% of metallic iron and from 8% to 10% of silica. The two ores have about the same amount of phosphorus, about 0.35%. The *soft ore* however can be concentrated by magnetic separators until it carries, as reported, 60% of metallic iron and less than 12% of silica. Magnetic concentrated ores, it is believed, will play a very important part in the future iron industry of this region, for the highly siliceous red ores that can not be used without concentration are very abundant here. Dr. W. B. Phillips, who has been conducting the magnetic concentration experiments for the Tennessee Coal, Iron, and Railroad Company, in discussing in the Engineering and Mining Journal, July 25, 1896, whether it was better to first artificially magnetize the *soft red ores*, which are not at all magnetic, before magnetically concentrating them or to merely dry, crush, and size them, says:—"The ore with which concentrates must compete at Birmingham is delivered in the stock houses for 50 cts. per ton. It carries 46% of iron. Even should the concentrates carry 55% to 56% of iron, the pressure of 46% ore for 50 cts. a ton will compel the maker of concentrates to save at every possible point. He may magnetize the ore and separate it, getting from a 40% ore heads of 58% to 60% of iron, but if he can dispense with the magnetizing and get from 54% to 56% of iron in the heads and much leaner tails, it would be to his advantage to do so." Dr. Phillips also says that the magnetic process of concentration can be applied with great advantage to the low grade hard or limy ores. The soft ore usually extends from the outcrop or surface for 150 to 200 feet down on the dip to where the *hard ore* sets in, though it in places extends down for nearly 300 feet. The distance that the *soft ore* extends down on the dip, however, is dependent on the nature or imperviousness of the cover, the *hard ore* occasionally beginning at the very o .tcrop. The passage from the one ore to the other is sudden,the line between them being distinct but crooked, the one ore extending in points into the other. The one is also found in places in detached patches in the other. Limestones, almost pure, also extend down into the ore in places and, in other places, there is in the good *soft ore* boulders of ferruginous sandstones. The *soft ore* may at first become a little more limy away from the outcrops, as does the hard ore,but they both, are usually, in any one place, very constant in their composition. The analysis of the *hard ore* at the head of the deepest slope, some 1800 feet on the dip, and from a bored hole, some 1500 feet to the southeast of the outcrop, were about the same as those of the ore within 200 feet, on the dip, of the outcrop.

The impurities of this ore, other than the carbonate of lime which when in constant and not too large quantities is not considered an impurity, as it is serviceable as a flux, often making the ore self fluxing, are sandy and clayey materials. Usually, the sandy matter is in rounded grains that are disseminated all through the ore while the clayey matter, small in quantity, is in interstratified shaly seams. The ore is often oolitic or a mere mass of rounded and glazed siliceous grains of various sizes, flattened and cemented together in a ferruginous matrix. It is often very fossiliferous with *crinoidal stems*, *bryozoa*, etc. The *soft ore* is commonly hard enough to be mined in blocks, though the blocks are sometimes easily crushed. The top part of the seams in places is a loose powdery mass or "*gouge*". This red ore is often poor, being very sandy or limy. It is frequently a conglomerate of flattened pea like quartz pebbles in a matrix of iron oxide. The *soft ore* stains the fingers and when freshly quarried is shiny with a more or less bright reddish color that is sometimes almost a scarlet, though it has no metallic luster. On long exposure, it becomes a dark reddish brown. These brown specimens of weathered ore, as more or less rounded gravels and nodules, are to be seen in places loose over the surface, all across the anticlinal valleys. The *soft ore* for many years furnished almost all of the ore for the furnace burdens in the Birmingham district but of late years the *hard ore* has rapidly grown in popularity and use, until it now, at times, furnishes as much as 90% of the ore burden. This is as it should be, as the *hard ore* is in much larger quantity than the *soft ore*.

This red ore has been in the past, and will be to a much greater extent in the future, the main stay of most of the funaces of the State. It makes a hard brittle or casting iron of excellent quality. It is either now, or has been mined in the counties of Jefferson, Blount, St. Clair, Etowah, DeKalb, and Cherokee. The ridges or mountains in which it occurs were described in Chapter II, under (g) Red Mountain formation. It is much the most highly developed in the East Red Mountain of the Birmingham Valley between Birmingham and Bessemer. It has there been worked in three seams that range in thickness from about 2 feet to 33 feet. The lowest two of these seams however come together towards the north-east, and the middle one splits into two benches or seams towards the south-west. The middle seam, known as the *Big* or *Red Mountain Seam*, is the main seam both in the thickness and, as a general thing, in the quality of its good ore. It has furnished much the most of the red ore that has been mined in this region. It has been quarried for almost the whole distance of 11 miles from Birmingham to Bessemer. For the greater part of this distance it is in two benches of about 10 feet each in thickness that are separated from each other by an intersratified seam of clayey shales and sandstones from the fraction of an inch to 5 feet in thickness. The quarries, open cuts, or strippings on its outcrops, extend down on the ore until the cover gets to be from 15 to 20 feet thick, or too thick to be profitably removed. Plates XIV and XXII illustrate outcrops of this Big or Red Mountain Seam, and the accompanying Plate XV as well as Plates XXIII, XXIV, and XXV, illustrate quarries or open cuts on its outcrops. Besides the open cuts, there are in this seam between Birmingham and Bessemer 25 well developed underground mines, which with two or three exceptions are worked by two companies. The largest of the individual mines have an output of over 1000 tons of ore per day. Plate XXVI is a sketch of one of the undergronnd mines. These mines are in only the Upper Bench of the Big Seam or its upper 10 to 14 feet, because the ore of this seam becomes more siliceous downward in a vertical section. The full thickness of this seam, however, has been worked in some of the quarries or open cuts. All of the ore that is mined between Birmingham and Bessemer is used in the 26 furnaces of the Birmingham district, It is used with a small admixture of limonite, with the exception of in 2 or 3 furnaces where it is used alone.

This red occurs also at the top of the Weisner forma-

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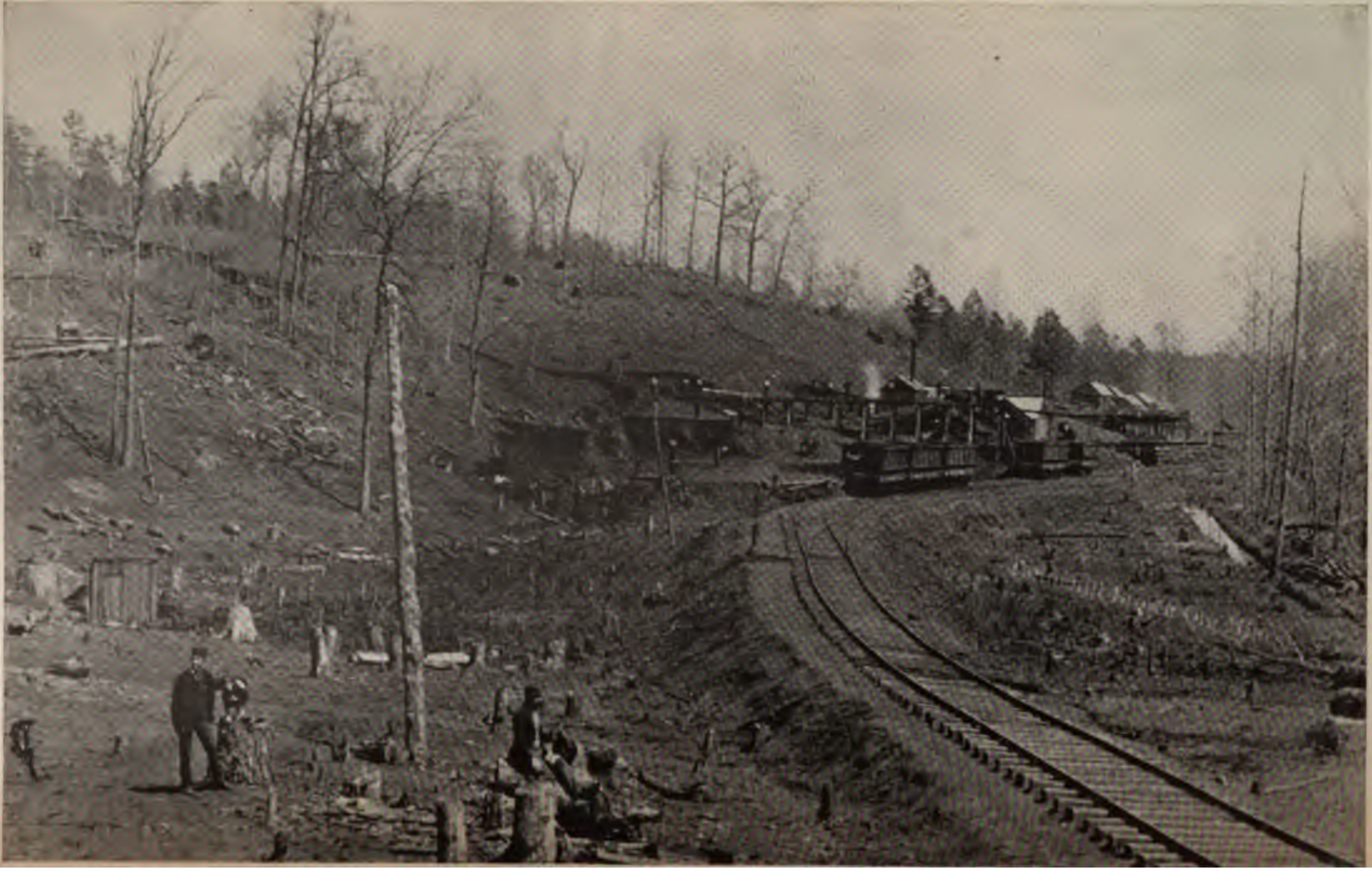
tion and bottom of Pelham (Trenton) Limestones, though at these horizons it is merely very local in its occurrence. It is in stratified seams that gradually change on the strike to other rocks. It is similar ore to that of the Red Mountain formation, though it is harder and non-fossiliferous. It is of very good quality, but is not in sufficient quantity to be of any very great commercial value.

Brown Ore or *Limonite* is second in importance of the iron ores of this region. When of good quality, it nearly always finds a ready sale at a good price. It is usually higher in iron than the red ore, though not so reliable in its occurrence and composition, and is not so easily and cheaply mined as the red ore. It is usually a very good ore that is easily smelted. It supplied all of the bloomeries, catalan forges, and charcoal furnaces in the early iron making in the State up to 1876, when it was clearly shown that good coke iron could be made out of red ores at a surprisingly low cost. The irregularity and uncertainty of thebrown ore in its occurrence, together with the cost of its mining, and of its often having to be washed, has always discouraged its use in the larger or coke furnaces except as a small admixture with the red ore. It has however been used alone in these coke furnaces when an especial tough iron was wanted. The kind of ore and the admixture of ore used in these coke furnaces, however, depend in a good measure on the kind of iron wanted. The limonite is however usually about 20% of the ore burden. Its great use now is in the coke furnaces as an admixture with the red ore, because of the great decrease in the demand for and the great increase in the cost of charcoal pig iron within the State. The increase in the cost of the manufacture of the charcoal pig iron in Alabama is due mainly to the increase in the cost or haul of the charcoal. The limonite constituted about 20.81% or 201,724 tons of the iron ore mined in the State in 1894.

This ore occurs in irregular pockets and also in stratified seams. Its deposits are scattered over a broad territory. They are so numerous and so many of them have been shown to be so extensive, that it is perfectly safe to say that their ore is in immense quantity, notstanding that the deposits as a general thing are too irregular to be judged of except just so far as they have been laid bare. The surface exposures of many of the fine deposits are very poor, The ore of the pockets is usually in separate masses, boulders, nodules, and gravels, scattered through an orange or reddish colored loamy matrix, though the ore in some of the pockets is almost solid. The percentage of boulder ore in most of the banks increases with depth below surface. The amount of material necessary to be removed for every ton of ore obtained varies within very wide limits within the same bank as well as in different banks. The ore is mined principally by contract, in irregular diggings and open cuts. Plates XVII, XXIX, XXX, XXXII, and XXXIII are views of some of these diggings and open cuts. The mining of this ore usually costs about 75 cents per ton and the ore is usually worth about $1.00 per ton laid down at the furnaces.

The ore occurs as hard solid compact ore, as cellular and honey comb ore, and as ochreous and earthy ores. It has commonly a dull metallic luster. It is nearly always closely associated with *clay horses* that are most commonly of quite pure white plastic clay. It is sometimes mixed with foreign matter, as loose chert, sandstone, and conglomerate.

The stratified seams are so variable as to make their ore almost as unreliable and uncertain as that of the



pockets. Plate XXXIV illustrates the outcrop of a stratified seam.

The limonite deposits are most numerous in the southeast or monoclinal part of the region where the strata are most broken up and have suffered most from denudation. Some of the principal limonite deposits, however, are in the north-west part of the region or in the narrow anticlinal valleys between the coal fields. The accompanying Plate XVI is a view of one of the finest of these deposits at the beginning of work on it in 1887, and Plate XXIX is of one of the banks of this same deposit in 1895. Many of the deposits have furnished large quantities of ore. They have been dug to a maximum depth of some 75 feet and some of them still have ore in their bottoms. Some of them, however, appear to be about exhausted, though in some, at least, of these the ore is merely covered up or hid by residual matter.

Most of the deposits and the greatest of them are along the top of the Weisner Quartzite and bottom of the Siliceous (Knox) Dolomite and Chert, and Fort Payne Chert formations, though these last two named formations have many deposits, some of them seemingly quite extensive, higher up in their strata. The deposits of the first and last named formations are mostly of the stratified ore, and there is no doubt but that many of the regular pocket deposits have been derived from the weathering and breaking up of the outcrops of the stratified seams.

There are some deposits of limonite, in both stratified seams and pockets, also in the Montevallo (Variegated) Shales and in the Coal Measures.

Some of the above pockets of limonite, are of Lafayette Age, though their iron has doubtless come from either underlying strata or strata close at hand of one the other of the above formations.

The principal limonite deposits of this region are the counties of Cherokee, Calhoun, Talladega, Shel Bibb, Tuscaloosa and Blount.

The ore, though mostly of very good quality, is v variable, being frequently of several grades in the sa bank. An average limonite of this region, dried, sho carry about 0.75% of lime, 0.40% of phosphorus, 0.1 of sulphur, 51.00% of metallic iron, 9.00% of sili and 3.75% of alumina. The basis of value of the li nites of this region is the amount of metallic iron a silica or insoluble matter. The regular pocket ore usually purer than the stratified ore, the weathering disintegration of the ore purifying it by the separat more or less of the mechanically mixed sand and che though the gravelly ore has frequently to be carefu washed to free it from adhering clay. The ore of the str ified seams is mostly a black waxy variety, high in s ca and phosphorus as well as in iron. The various ores the same bank are usually in small pockets to themsel though it frequently happens that the same boulder partly a good ore and partly nothing more than a fer ginous sandstone. In such cases, as when the ore is mi with boulders, nodules, gravels, etc., of chert, sa stone, and conglomerate, the ore has to be picked o with the hand and hammer, making it tedious and pensive to mine, The ore in some of the banks is a mixed with a pinkish argillaceous ferruginous sh that is called *slate* by the miners. The nodular a gravelly ore is usually washed, though the lump, bo der, and massive ore,picked out by hand, is often dur ed into the furnace just as it is taken from the ba

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The ore is sometimes calcined before it is put into the furnace.

The brown ores of this region having wholly supplied the charcoal furnaces of the State, these furnaces are almost exclusively in the south-east part of this region where the limonite deposits are most numerous. The accompying Plate XVII is of a portion of one of the oldest and most extensively worked brown ore mines of Alabama.

The Black Band and Clay Iron Stone. These are impure carbonates of iron and are, strictly speaking, the iron ores of the Coal Measures. The principal limonites of the Coal Measures have boubtless been derived from them.

The *Black Band* is the coaly carbonate of iron. It is in regular stratified seams from a few inches to several feet in thickness. The ore however is very variable, it changes in places to stone coal. It occurs in a great many places but no attempts to mine or work it have ever been made except at Warrior and at New Castle. Attempts were made to use it both raw and calcined in the furnaces. It was calcined with its own coal in heaps in the open air. Some of this calcined ore resembles metallic iron. It is said to work very well in the furnace when mixed with a siliceous ore.

The *Clay Iron Stone* is in interstratified thin seams and layers of brownish and yellowish nodules and flattened concretions in shales. It too occurs in many places, though in none of the known places does it appear to be in sufficient quantity to be of commercial value.

Grey or Magnetic Iron Ore occurs in places in the upper strata of the Weisner formation in the south-east part of this region, in Talladega county, It is in from

1 to 4 regularly stratified seams that vary in thickness from about 2 to 8 feet. The top one of these seams occurs at exactly the same geological horizon as the perhaps largest limonite and manganese deposits of this region and as also some red iron ore deposits. It in places can be seen to change gradually to a limonite or to a sandstone or quartzite. This grey ore, often tinged greenish, is usually very siliceous or is commonly nothing more than a hard dark grey sandstone with black shining grains of magnetite. It however sometimes carries as much as 80 per cent. of ferric oxide with from 17 to 18 per cent. of silica. It is sometimes a massive amorphous rock and at other times it is a flaggy rock that is so stringy or fibrous as to look very much like old weathered wooden chips. These flags on weathering usually break up into wedge like fragments that are determined in length, about 18 inches, by vertical joints. They occasionally have magnetic properties. This magnetic ore also occurs as a black specular loking ore, high in iron and titanium, that is in thin veins, plates, and lenses in the grey ore, sandstone, and quartzite. This black ore often forms a covering or shell, with a maximum thickness of ½ inch, to the looose grey ore sandstone, and quartzite. It however most commonly accompanies white quartz veins and hence it is most commonly seen as thin sheets on white quartz fragments. It usually has magnetic properties, though not always.

About 100 tons of the grey ore of the Wewooka Mountains are said to have been smelted in the furnace and to have yielded an iron that was too brittle to hold up even its own weight. This grey ore, however, is in considerable quantity and hence it is hoped that on a thorough test it will be found to work well in the fur-

nace and to give a much better grade of iron.

***Pyrite*. This ore may be said to occur in all of the formations of the region, though in comparatively small quantities. It is most abundant in the Black Shale (Devonian). It is in rounded grains and balls and flattened scales and irregular strings disseminated throughout the rocks. Its oxidation or decomposition has given rise in places to limonites and in other places to copperas, etc. It is the source of the chalybeate and sulpher springs of the region.**

ALUMINUM MINERALS.

These minerals are now used principally for the manufacture of aluminum alloys and compounds, refractory materials, and potter's ware, and not for the metal aluminum. They consist in this region of *bauxite* and *clay*.

Bauxite. This newly discovered ore of aluminum in Alabama, the tripple hyrate of aluminum, is now regarded, because of its abundance, solubility, and purity, as one of the most important of all ores for the manufacture of aluminum and its alloys and compounds. It, of all ores in this region, is next in importance to the iron ores. Its clay variety is called *wocheinite*. It was first discovered or recognized in Alabama in 1890 by Mr. R. S. Perry, now Superintendent of the Southern Beauxite Mining and Manufacturing Company. Previous to that time, it had been known to the miners of limonite as *iron ore blossom* and *Clinton or siliferous iron ore*.

It has usually a pisolitic or concretionary character, though it is sometimes a hard, compact, homogeneous, fine grain rock that is commonly oolitic, though sometimes an earthy clay-like material. The concretions vary in size from grains to pebbles and from pebbles to large boulders. So the concretionary ore may be either oolitic ore, pisolitic ore, pebble ore, nodular ore, or boulder ore. The concretions often have a hollow interior that is partly filled with a white powder. The matrix, often barely enough to hold the concretions together, is commonly a bauxitic clay or siliceous material, with some smaller bauxitic concretions in places and hence is not as good ore as a general thing as the concretions. It is usually softer than the concretions, especially on the weathered outcrops. In the case of the boulder and pebble ores, the ore is often friable or the concretions are but loosely held together. The best of the bauxite ores, however, are hard and compact enough to have a metallic ring. These best ores often have a waxy luster. The ores however are all softer below the surface than on the surface, the oolitic and amorphous varieties being sometimes a soft powder below the surface. The porous, spongy, or vesicular ore has a pitted appearance. Its pores or vesicles like the cavities of the pebbles, are often partly filled with a fine siliceous powder. The pores or vesicles are due to the weathering out of the soluble or hydrated alumina. Their ores are therefore confined more or less to the surface. In their case, the matrix is usually harder and more compact than the concretions. The earthy or clay-like variety, *wocheinite*, is a bauxitic kaolin or clay, or a mechanical mixture of bauxite and kaolin and clay. It often carries irregular streaks of quite pure halloysite.

Bauxite varies in color from an almost pure white to a deep red or black. It is also of cream white, grayish, yellowish, amber, pinkish, speckled or mottled, etc., colors. These colors often shade into one another, sometimes suddenly and sometimes gradually, and so it is seldom, if ever, that a bank or deposit is wholy or uniformly one colored ore. The ore is commonly stained more or less with iron. The colors are also due to manganese and other minerals, and sometimes to organic matter. As a general thing, the light colored ores appear to be softer than the dark colored ones. The amber, red, black, and dark brown ores have sometimes spots as hard as quartz, while some of the white or light colored ores, especially the bauxitic clays, are as soft almost as clay itself. The good ores vary in hardness from about 1 to 3 and in specific gravity from about 2.40 to 2.55.

This ore is in irregular or ill-defined beds or pockets, though it always shows more or less stratification. The deepest diggings down on it, from 60 to 70 feet deep, have not struck any bedded rocks, other than the bauxite itself. It is closely associated with limonite and clay. It is also accompanied by manganese ore and lignite. The associated clays lie both over and under the bauxite, and in it as *clay horses*. These clays form some very extensive deposits. They are usually unctuous and free of grit. Some of them are white and pure, being in places a very pure halloysite, while others are of mottled, reddish, pinkish, bluish, brownish, blackish, etc., colors. The lignites, in very irregular pockets, become dingy on exposure, though they burn freely, leaving but little ash.

The principal known bauxite deposits are in the lower part of the Siliceous (Knox) Dolomite and Chert formation, though the ore occurs also higher up in this formation and at the top of the Weisner formation. The deposits are of a comparatively narrow broken belt that extends from Georgia to the south-west in Alabama as far as Anniston. They are therefore confined in Alabama to the counties of Cherokee, Cleburne and Calhoun. They are too irregular to allow any close estimate to be formed of their extent. All that can be said is that the known deposits have a very great amount of ore in sight, enough to last at the present rate of output for a good many years.

Bauxite, a triple hydrate of alumina (Al^2O_3,H_2O) in which more or less of the alumina is replaced by iron or manganese, is usually contaminated with silica, clay, titannic acid, etc. It is very variable in its composition and so deceptive in its looks that its quality can not always be determined by the eye alone. Its value is of course dependent on its percentage of alumina and freedom from impurities. The analyses, see Siliceous (Knox) Dolomite and Chert formation under Cherokee and Calhoun counties, Chapters XIII and XIV, show that the bauxites of this region compare well in quality with those of any other country. The manufacturers say that the Alabama and Georgia bauxites are more soluble than those of Europe and so they are preferred at a higher price, notwithstanding that they often have less alumina. Their greater solubility is believed to be due to their being truer bauxites or triple hydrates than the European bauxites, which are probably partly monohydrates (*diaspose.*)

The bauxite mines are nothing more than irregular open diggings and cuts with deep drainage channels and tunnels leading off from them. Rainy weather therefore usually stops all bauxite mining and sometimes does considerable damage to the banks in causing slides. The accompanying Plate XVIII shows one of these mines or diggings and Figs. 15, 16 and 18 are sketches of others. The ore is easily mined because of its comparative softness beneath the surface, being usually soft enough to be dug up with the pick. It is however ex-

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pensive to mine because of its variableness in quality, requiring it to be assorted. Almost every mine carries several grades of ore. The ore is concentrated and assorted by means of screens and the hands. It is exceedingly hydroscopic and so it has to be dried before shipping. It is dried by spreading out under sheds and by artificial dryers. Fig. 17 is of a photograph of a bauxite shed and the accompanying Plate XVIII shows a house with artificial dryers or heated revolving hollow iron cylinders through which the ore is passed.

Two companies, the Republic Mining and Manufacturing Company, Rock Run, Alabama, and the Southern Bauxite Mining and Manufacturing Company, Cave Springs, Georgia, are engaged in the mining of this ore in Alabama. The first of these companies has three mines in Alabama and the other two. The mines are all in the *Dyke District*, Cherokee county. The output in 1895 was 14,000 long tons. The ore that has been shipped is mainly of the very best quality and so there is accumulating at the mines a great deal of ore of an inferior grade, though very good ore. This is much to be regretted, especially since nearly all the output is used for the manufacture of alum and a much inferior ore, or one much higher in iron and silica, could be used for this purpose just as well. This shipment of the best ore has been a necessity, as the mines are new enterprises that had to meet in competition the shippers of cheap foreign ores with an established reputation.

The mines are in a broken country several miles to the north-east of Rock Run, Alabama, and to the south-west of Cave Springs, Georgia, to which two places the ore is hauled in wagons to be loaded on cars. The cost of mining and putting on the cars is about $3.45 per long ton. The freight rates to the present markets is from $4.50 to $9.00 per long ton. It is sold at from $7.00 to $13.00 per long ton, according to the quality of the ore and the locality of the market. If the market is a sea-board city, the ore has to be sold at a less figure than if it is an interior city, in order to meet the foreign competition. The present markets are New York, Philadelphia, Pittsburg, Buffalo, Brooklyn, Bayonne, Syracuse, Cleveland, Natrona and Lockport, where are situated the alum and aluminum works. Some of this ore, on account of its superior quality, has been shipped to Germany.

The ore is easily reduced, giving metallic aluminum of great purity at moderate cost. Its principal uses now however is for the manufacture of aluminum salts or compounds, especially alums, which are largely use in the manufacture of paper, dyes, and baking powders. A compound, aluminate of soda, is largely used in dying and calico printing. The greatest future value will doubtless be the manufacture of the highest grade refractory materials, like crucibles, fire bricks, etc. The better class of ores should be kept for this purpose, while those of inferior quality could be converted into alum and the other compounds. An ore carrying as much as 10% ferric oxide and 20% silica can be easily used for the manufacture of alum. Another important use of bauxite is now claimed in the preparation of alumino-ferric cake, a cheap by-product, that is employed for the purification and deodorization of sewage and for the making at the same time of valuable fertilizers therefrom. This compound, it is stated, is especially adapted to the cleaning of rivers and large streams.

Clays.—Refractory or porcelain and plastic clays, fusible or potters's clays, and loamy or common brick clays, all of very good quality, are to be found in abundance in many parts of this region. It is therefore believed that Alabama will soon take a high rank in the list of clay producing States.

The *refractory or porcelain and plastic clays* are by far the purest and most important of these clays. They are usually almost white, though they are sometimes a gray or brown color from the presence of organic matter. They occur in irregular local deposits or pockets in the Fort Payne Chert, Siliceous (Knox) Dolomite and Chert formations and as irregular interstratified laminated layers in the detached patches of the Tuscaloosa formation that overlie the Paleozoic strata. They also occur as *clay horses* in many of the limonite and bauxite banks. They are unctuous and frequently pure enough to possess in an eminent degree the most important qualities of whiteness, plasticity, and of hardening under heat. They make a fine quality of porcelain. They frequently have interbedded with them irregular seams of a coarse white gritty powder that is almost pure silica. This silica with just enough of the plastic clay to hold it together is used in the manufacture of fire bricks. It is also used or mixed in certain proportions with the plastic clays in the manufacture of porcelain ware to prevent too much shrinkage on burning. These clays have been mined in only a few places, principally in DeKalb county in the Fort Payne Chert and in Tuscaloosa county in the Tuscaloosa Formation, see county details. The Fort Payne Chert clays were shipped for several years to a pottery plant at Trenton, New Jersey. This clay, the run of the mines, is said to have brought $10 per ton F. O. B. at the mines. These clays carry pockets of halloysite that are said to have brought $20 per ton F. O. B. at the mines. The pot-

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massive mineral that is sometimes granular like a white marble and sometimes earthy. It is most often found in nodules and boulders imbedded in a clay overlying limestones and dolomites, and as a loose *float* over the surface. It occurs also in regular beds or in pockets and veins. It is commonly associated with other mineral substances, especially galena.

It is found in this region in a number of places in Calhoun, Etowah, St. Clair, and Bibb counties. It doubtless occurs in many other places in these counties and in other counties of this region. It is said to occur in Jefferson county. Some of these known deposits appear to be in workable quantities, as the deposit near Tampa, on the East and West Railroad.Calhoun county; a deposit just west of Greensport, St. Clair county; and deposits in Bibb county near the McGuire shoals on the Little Cahaba River and the *Sinks* on Six Mile Creek. The first of these deposits is the only one that has ever been tested. For descriptions of all the known deposits in this region, see Siliceous (Knox) Dolomite and Chert formation under the above named counties.

All of the deposits of this region are in the Lower Silurian Formation. The principal ones are along the dividing line between the Siliceous (Knox) Dolomite and Chert and Pelham or Trenton Limestones, though many of the lesser deposits are far within the boundary of the former of these formations, and it may be that there are pockets and veins of the mineral far within the latter formation.

Pockets and veins in the underlying bedded rocks have doubtless furnished the loose nodules and boulders now imbedded in the overlying residual clays, etc. The loose nodules and boulders would of course have to be mined by open pits while the ore in pockets and veins in the bedded rocks would doubtless have to be gotten, for the most part, by underground mining.

The mineral is put upon the market only as a fine ground powder. It is sometimes prepared for the market by simply crushing and grinding the carefully washed ore and assorted fragments. More commonly, however, the crushed ore is boiled with dilute sulphuric acid and then, to get rid of the acid, with pure water. It is next ground, and then sorted by *floating* in water, as it is called. The coarser powder settles quickly, while the very finest powder, the most valuble part of the ore, remains longest in suspension. The washed ground ore is finally dried by steam, barreled and shipped. The most common and objectionable impurities are siliceous matter and iron stains. The former gives a gritty feeling to the powder and the latter injures its white color.

Pure barite has 65.7% of barium and 34.3% of sulphuric anhydride. In the native state, however, the barium is commonly replaced by more or less strontium and calcium, and the mineral has usally some impurities of silica, clay, and bituminous matter. There are no analyses of the mineral in this region, though, as a whole, it appears to be quite pure.

The price of barite varies very much with the different makers and with the various grades of the same maker. The best grade is now worth from $18.00 to $20.00 per short ton, and the crude material about $6.00 per short ton. It does not take much of a pile of the ore to make a ton, as it weighs more than one-half as much as metallic iron.

Barite ranks next to white lead as a white pigment. Its principal use is, therefore, as a paint, as an admixture with white lead, which it resembles in both color and weight. In Europe, it is held as a valuable addition to white lead, though in this country its admixture is still looked upon with disfavor. The highest authortites say that an addition of 35% barite to white lead for paint is to be desired, as it detracts nothing from the quality and body or covering properties of the paint, while it adds to its permanency, in that it is not effected by agencies that discolor and destroy pure white lead. The only tenable objecttion to this use of it, therefore, is that the purchaser pays for one thing and gets another. Some, however still hold that it injures the body and flowing properties of the white lead. It is used as an adulteration to give weight to other things in which there is no disputing its non-beneficial effects. It also has some other legitimate and good uses, as in the manufacture of paper and of canvas for the covering of the products of the pork packer. In the former case, it serves as a makeweight, and in the latter to stop the meshes of the canvas so as to keep out insects.

MANGANESE ORES.

The black oxide or peroxide, called pyrolusite, and the brown oxide or hydrated sesquioxide, called manganite, are the only ores of manganese that may posibly occur in this region in sufficient quantity to be of commercial value. It is sometimes a difficult matter to say which of these oxides an ore belongs. They are to be found in this region in a great many places in small quantities but in only a few places do they appear to be in workable quantity. They are very intimately associated with the limonites. They occur just as do the limonites in irregular pockets of ore masses, boulders, lumps, nodules, and gravels, in a residual loam and in stratified seams. They are found in the same localities and geological horizons as the limonites. In fact, they are nearly always accompanied by limonite, and the same stratum that is in one place a limonite is in another place a manganese ore. The ore often occurs in veins and streaks through sandstones, quartzites, and chert boulders, and as a cementing material in breccia of these rocks.

The principal known manganese deposits in Alabama are in Cleburne county at the top of the Weisner formation, in Blount county near the bottom of the Fort Payne Chert, and in Cherokee county in the Siliceous (Knox) Dolomite and Chert formation. See county details for descriptions of these deposits. Several of the Cleburne county deposits have been worked. One of them appears to have been about exhausted. It doubtless furnished all of the manganese ore that has ever been shipped away from Alabama, reported to be only about 75 tons. A manganiferous limonite of a deposit in the Weisner formation near Anniston was converted in 1875 into *spiegeleisen* and *ferro-manganese* at the Woodstock Furnace No. 1, Anniston. Its use is said to have been the first attempt in the United States to manufacture *spiegeleisen* and *ferro–manganese* from manganese ores. The total amount of spiegeleisen made from it is said to have been about 1,000 tons with from 8 to 60 per cent of manganese.

The principal use of manganese is in connection with steel and iron manufacture. It makes them tougher, harder, and more durable. It makes iron suitable for car wheels, The ore is worth about $15.00 per long ton at the markets.

LEAD ORE.

Galena, the most important ore of lead, has been found in small quantities, as loose nodules and as small balls and thin veins in bedded rocks, in many parts of this region, though in no one of the known places in Alabama is it believed to be in workable quantity. It was worked some, however, during the late war about 5 miles west of Jacksonville, Calhoun county. This deposit, as are most of the other deposits in the bedded rocks, is in small nodules and thin veins in interstratified layers of the Pelham (Trenton) Limestones. This ore has been seen also in a few places in very small quantity in the bedded strata of the underlying Siliceous (Knox) Dolomite and Chert.

The loose surface pieces that have been found vary from about the size of a marble to chunks the size of one's head. These loose pieces are confined to no particular sections or geological formations of the State. They are however most common around the old *Indian mounds* and hence they are believed to have been brought here from Missouri or some other country by the *mound builders*. There are however, many old tales of large deposits of lead in many sections of this region from which the hunters of generations ago got their lead. There has also been handed down in many sections of this region old Indian and negro tales as to the presence of large lead deposits in those sections.

GOLD.

Native Gold occurs in many places in the interstratified thin seams and lenses of quartz in the Talladega Slates or semi-crystalline strata along the south-east edge of this region. This gold is often free gold that can be seen with the naked eye. The quartz in places appears to be very rich in gold, though it is thin and imbedded in hard tough rocks and is hence expensive to mine. It has however been mined in several places at intervals in a primitive and desultory way for a great many years. Some of these old mines have yielded in the aggregate, a great deal of gold and could now be made to pay, it is believed, if they were worked systematically with sufficient capital and after the most improved methods for mining and collecting the gold. For descriptions of this gold and these old mines, see, under Talladega County, Talladega Slates and the paper on "Gold Mining in Talladega County," by Dr. William Taylor.

MARBLES.

Marbles or hard durable limestones and dolomites that will take a good polish are found in many parts of this region in all the limestone and dolomite formations. The main deposits of true marbles or of crystalline limestone and dolomites are to be found, however, in the south-east portion of the region, in the more or less metamorphosed strata, the truest or most crystalline marbles being along the great Talladega Thrust Fault that divides this region from the crystalline strata. The best and largest deposits are in Talladega county. They are of the Coosa (Flatwood) Shale and Siliceous (Knox) Dolomite and Chert formations. Farther to the north-west, however, in Bibb, Shelby, Calhoun, Jefferson, etc., counties, there are some very good marbles in the Pelham (Trenton) Limestone and in the Oxmoor Shale and Sandstone formations. Many of these rocks are variegated and beautiful after being polished. Those of Talladega county are of white, bluish, and dark colors. They take an exquitite polish and have been worked to a considerable extent in 8 to 10 different quarries, though they are not worked at all now. Those of one quarry, beautiful crystalline rocks, have also been used as a flux in an iron furnace. Those farther to the north-west, of the Pelham (Trenton) Limestones along the Cahaba River in Bibb County, have also been worked. See county details and Dr. William Taylor's paper on "The Marble Industry of Talladega County" for descriptions of these different marbles.

BUILDING, PAVING AND CURBING STONES.

These rocks of good quality and convenient thicknesses can be had in abundance in nearly all parts of this region. They are usually soft enough on being quarried to be easily cut or sawed, but they harden on exposure.

Building Stones.—These stones are both sandstones and limestones. Their output for 1894 was estimated in the Mineral Resources of the United States for 1894 at $228,369. The *sandstones* have been quarried in Tuscaloosa, Jefferson, Etowah, Calhoun, Talladega, Saint Clair, etc., counties. Those of the Coal Measures were used in building the locks in the Warrior River, those of the Oxmoor Shales and Sandstones in the bridge piers over the Coosa River at Gadsden, those of the Red Mountain formation in many of the Birmingham structures, and those of the Weisner formation, often variegated, in many of the handsome buildings around Anniston, etc. The native sandstones are used in all sections of this region for foundations, chimneys, culverts, fence walls, etc. The value of their output for 1894 is estimated in the Mineral Resources of the United States, 1894, at $18,100, but this is entirely too little. The best and most of the sandstones used in building the locks at Tuscaloosa were taken out of the bed of the river in blasting out the channel. See Plate XIII.

The *limestones* are used for all kinds of building purposes. They were used in building the locks along the Coosa River below Greensport and the piers of the railroad bridge over the Coosa River at Riverside, etc., etc. They have been quarried in Bibb, Shelby, Jefferson, Saint Clair, Talladega, Calhoun, DeKalb, etc., counties. The quarries are in several formations, though the most important of them are in the Pelham (Trenton) Limestones. The output for 1894 was valued in the Mineral Resources of the United States, 1894, at $30,925.

Paving and Curbing Stones, of very uniform thickness with smooth and beautifully ripple-marked sides, abound in numerous localities in the Coal Measures and Red Mountain formations of this region. They can be had of almost any thickness, length, and width. They are so uniform in some of the bluffs and outcrops that they have received the name in certain localities of *plank rocks*. They have been used in Birmingham for paving and curbing purposes and in a great many localities for building chimneys and for head and foot stones and coverings for graves.

SLATES.

Clay slates that have been metamorphosed or changed by heat and presure until they possess the toughness and cleavage of roofing slates crop out in many places along the south-east edge of this region. The most promising of these outcrops are in Shelby, Talladega, Calhoun, and Cleburne counties. They are of the Weisner formation, Montevallo (Variegated) Shales, and the Pelham (Trenton) Limestones or Rockmart Slates.

Some of them have been dug into, but by inexperienced parties who knew nothing about the peculiar methods of slate quarrying, and hence it may be that in some instances the good prospects have been injured. It is to be hoped that experienced slate men will soon take hold of some of these outcrops and develop them as they should be. The only use that has been made of these slates, so far as known, was the shipping during the civil war of some of them from the south-western part of Talladega county to Memphis, Tenn., for roofing purposes. Slates are also used as mantels, window sills, etc.

MILLSTONES, GRINDSTONES, AND WHETSTONES.

Millstones of very good quality can be made in many places out of the conglomerates of the Weisner formation, Coal Measures, and Lafayette formation of this region. They are being made in several places out of the hard conglomerates near the base of the Coal Measures and out of the ferruginous conglomerate of the Lafayette formation. The millstones from these rocks have good local reputations. It is believed, however, that the quartzitic conglomerate of the Weisner formation is in places a still better rock for this purpose.

Grindstones and Whetstones.—The hard compact coarse and fine grained flaggy sandstones of the Coal Measures and Red Mountain formation are seemingly very good grit in places for respectively grindstones and whetstones.

LITHOGRAPHIC STONES.

Many of the fine grain compact dolomites of the Siliceous (Knox) Dolomite and Chert formation look as if they might make very good lithographic stones. They are of grayish and yellowish gray colors. They have a conchoidal fracture and are homogeneous throughout. Of a sample from Talladega county that was doutbless of this formation, Dr. George P. Merrill, Curator of Geology in the United States National Museum, says: "The Alabama stone examined by the writer is finely granular and too friable for satisfactory work. Qualitative tests showed it to be a siliceous magnesian limestone. It is, of course, possible that the single sample shown does not fairly represent the product." It is hoped that the above sample was not as good as an average sample of the lithographic looking rocks of this formation. Other formations, as the Pelham (Trenton) Limestones and the Bangor Limestones, have in places strata of compact homogeneous argillaceous looking limestones that might make lithographic stones. Still it is impossible to tell from mere looks or from even chemical analyses whether a rock will make a good lithographic stone or not, an actual practical test being the only thing that can be relied on.

LIME BURNING AND FLUXING ROCKS.

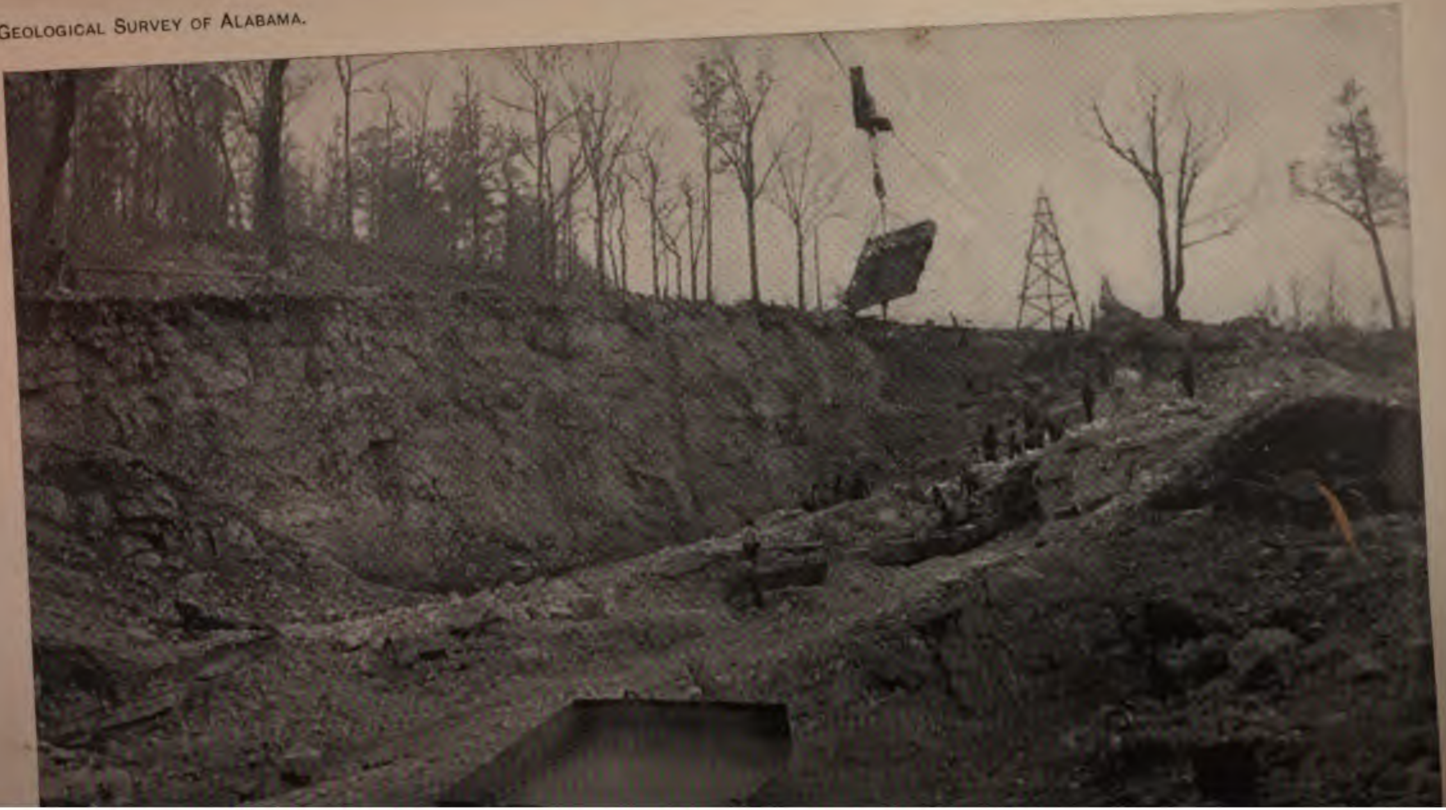
These rocks or limestones and dolomites of pure quality occur in abundance in nearly all parts of this region. They sometimes are very pure or have less than one per cent of silica and only traces of iron and alumina. They are to be found in the Bangor Limestone, Pelham (Trenton) Limestone, and Siliceous (Knox) Dolemite and Chert formations. Those of the Bangor Limestone, or its contemporaneous type Oxmoor Shale and Sandstone formation, are scarce in the south-east part of the region. Limestones and dolomites, when pure, are suitable for and are usued for a great many purposes but those of this region are used much more for lime burning and fluxing, than for all other purposes combined. The quarrying of lime burning and fluxing stocks constitutes one of the great industries of this region.

The *lime burning rocks* of this region, so far as known, are confined to the limestones, though not because the dolomites will not make a good quality of quick-lime. The limestones used are of the Pelham (Trenton) Limestones which makes a "fat'' lime, though the purer limestones of the other formations would make perhaps about just as good a quick-lime. The principal quarries and kilns of this region for the lime burning rocks are in Shelby, Etowah, and Calhoun counties. The lime made in these counties had a value in 1894, according to the Mineral Resources of the United States, 1894, of $171,344. Plate XX is a view of one of these quarries and its lime kilns.

The *fluxing rocks* were also exclusively limestones up to a few years ago but now they are in a great measure made up of a mixture of limestones and dolomites.The dolomite flux is found to be much the better for the making of the new product, low silicon pig iron,of some of the furnaces of this region. It is purer than the limestone flux, as it has on an average only about 1.50 per cent. of silica, while the limestones used as flux will average about 4.00 per cent. silica. The principal quarries of this region for fluxing limestone are in Jefferson, Blount, Etowah, Shelby, Talladega, Calhoun, and Cherokee counties. They are in the Bangor Limestone and Pelham (Trenton) Limestone formations. The fluxing dolomite is mined now only in Jefferson county, though it has been mined to a slight extent in Talladega and Calhoun counties. This use, of limestones and dolomites, to keep up with the iron industry, has grown very rapidly until it now consumes most of the limestones and nearly all of the dolomites quarried in this region. The fluxing rocks quarried and used in this region in 1894, must have had a value of between $275,000 and $300,000. The accompanying Plate XIX, as well as the Plates XX, XXI, and XXXI, are views of some of these flux quarries.

ROAD AND BALLAST MATERIALS.

The necessity and pleasure of good roads are begining to attract codsiderable attention in this region. In several of the counties enough has been done towards getting them to enable the people to see the great advantages and profit arising from them. In these counties, however, enough care is not taken in the laying out and building of the roads. Sufficient attention is not being paid to the proper grades, drainage, and kind of materials used. Inferior materials are used in some instances simply because they are a little more convenient or can be gotten a little cheaper. Sandstones are used in some places, a very poor material as a general thing, for this purpose. Good materials, however, are in abundance in nearly all parts of this region, The best of these materials are rounded pebbles of flint and chert, angular nodules of chert, and hard limestones and dolomites. The rounded pebbles, however, would require a matrix or cementing material, as clay, to keep them from rolling. They occur loose in beds with sandy loams. They are of the most recent geological formations and hence they are most abundant along the south-west portion of this region and along the rivers. The angular cherty nodules of already the proper size are of the Siliceous (Knox) Dolomite and Chert and Fort Payne Chert formations. They cover the sloping sides of hills



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ASTOR, LENOX
TILDEN FOUNDATIONS

and ridges and are abundant in nearly all parts of this region. The limestones and dolomites of all the formations that bear them are hard and durable enough for this purpose. There is therefore a scarcity of them in but few sections of this region. Their angular fragments, like the angular cherty nodules, on packing frequently become by a natural process cemented into a firm unyielding solid mass. The cherty nodules have been mined considerably in Jefferson county for use on the county roads and for shipments to other counties. Plate X shows imperfectly on its left or north-west side a bank in the Fort Payne Chert.

Ballast materials include, in addition to the above road materials, sandstones and furnace slag. The slag has been used also for road making but it, as a general thing, is not suitable for this purpose, as it soon wears into holes.

HYDRAULIC CEMENTS.

The siliceous clayey calcareous shaly strata in the upper part of the Pelham (Trenton) Limestones are believed to be in places a very good natural hydraulic cement rock. These strata near Siluria, Shelby county, are said to have been once tested practically and to have yielded a very good hydraulic cement.

MINERAL PAINTS.

This region possesses in large quantities very good raw materials for the paint grinders. These materials consist of iron ores, ferruginous clays and loams, and barite.

The leached red ore is often, especially when it has a greasy feeling and is free from grit, well suited for the

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making of a strong iron or metallic paint. Its stain is with difficulty removed from the hands or clothing. This peculiar ore is to be found in many places in large quantity. It has been shipped some from Attalla to paint works in Chattanooga, at the rate of about 2,000 tons per annum.

The ferruginous unctuous clays and the so-called irony slates or the argillaceous shaly ore of the limonite banks are often fine paint and ocher materials. Some of these clays feel and look very much like castile soap. There are also scattered over this region, away from the limonite banks, deposits of ochreous loams that might make very good paints. These clays and loams are of various colors from a light yellow to a deep red.

The barite in the deposits of this region is pure and white enough to be used as a white paint. It ranks next to white lead as a white pigment. Its principal use is as a paint, as an admixture with white lead. This admixture, however, is looked upon in the United States as an adulterant, notwithstanding that the best authorities say that an addition of 35% to 50% of barite to white lead improves the paint, as it adds to the permanency and does not injure the quality or flowing properties of the paint.

These raw materials for paint making in the conversion into the finished products have to be crushed, dried, ground and reground, bolted, etc., until they are in an impalpable powder. They are thus increased in value many fold, though there is profit in their paints. The *iron or metallic paints* do not require much oil in mixing. They are especially well adapted to the painting of railroad cars, bridges, barns, roofs, wagons, agricultural implements, etc. *Barite paint*, because of its cheapness and permanency, might well take the place of white lead paint in many places, especially where exposed to deleterious gases.

The Alabama ochre production is given in the Mineral Resources of the United States at 375 short tons in 1892, valued at $4,050, and at 350 short tons in 1893, valued at $3,000, and, with the addition of the output of Kentucky, at only 268 short tons in 1894, valued at $2,731.

TRIPOLI OR POLISHING POWDER.

A very porous rock of a finely divided siliceous material with a harsh feel that is good for polishing purposes is to be found in greater or less quantities in many parts of this region. It is called "*rottenstone*" and is the resultant of the thorough leaching of the cherty limestones and calcareous cherts of the Siliceous (Knox) Dolomite and Chert and Fort Payne Chert formations. It is therefore quite a different material in origin, though it has about the same chemical composition, as the infusorial or diatomaceous earth, or "fossil flour," of organic origin, that was originally called tripoli and is used as a polishing powder. This porous leached rock in its conversion into polishing powder has to be crushed and ground into a fine powder and bolted. This rock is also manufactured in some countries into filters and blotting pads. The largest and best deposits of it in this region, so far as known, are in Talladega and Calhoun counties. A car load is said to have been shipped from a Talladega deposit. This deposit is in a cave, called "*tripoli cave*", in S. 34, T. 17, R. 4 E., on the side of a ridge in a broken country of the Siliceous (Knox) Dolomite and Chert formation. Over the top of this ridge, there is said to be a deposit of the other kind of tripoli or of the infusorial or diatomaceous earth. This infusorial or diatomaceous earth or tripoli, of recent or Pleistocent age, has been discoverd by Mr. K. M. Cunningham in large quantities near Mobile and Montgomery. Of the Montgomery deposit, the State Geologist, in his Coastal Plain Report, speaks thus:—"At Montgomery the diatomaceous deposit forms a component part of the river terrace or second bottom, and but for the fact that the land upon which it occurs is in the midst of the city and therefore of very great value, this deposit would undoubtedly be profitable to mine". This diatomaceous tripoli will most probably soon be found in the central and southern parts of the State in large deposits where the land is not near so valuable.

SAND.

Building sands of good quality and in almost inexhaustible quantites are to be found in nearly all parts of this region. They occur in loose beds on the highlands close to and over the rocks from which they have been derived and as washed sands along the principal streams. They can also be easily and cheaply derived by crushing the soft friable sandstone outcrops in many parts of this region, of several of the geological formations. The best and purest of these sandstones and hence the best and purest sands are of the Coal Measures and Oxmoor Shale and Sandstone formation. The Weisner formation has some very pure sandstones and quartzites, though they are much harder rocks and don't give rise to many sand beds. The lower siliceous strata of the Siliceous (Knox) Dolomite and Chert formation also weather in places into extensive beds of good sand. Coarse angular sands of very good quality occur also in interstratified irregular seams in the Tuscaloosa formation in the south-west part of this region and in detached patches over a good part of this region. All of these sands, even the washed sands, are coarse angular, and sharp enough for good mortar sands, and many of them are pure enough for glass sands. Their chrystalline faces glisten in the sun light. The sand for the Glass Works an Gate City was gotten from sandstones, at the very door of the works, of the Oxmoor Shale and Sandstone formation. The sandstones used at these works are said to be 99 per cent. silica. They make the cut seen in the distance on the G. P. and C. & W. railroads, Plate X.

A finely pulverulent white chalky sand that might answer very well for a molding sand occurs in many parts of this region. It has been derived from the weathering of the siliceous strata of the Siliceous (Knox) Dolomite and Chert formation. It probably occurs in places also with the Fort Payne Chert.

MINERAL WATERS.

Mineral Springs are dotted about over most of this region. Some of these springs have more than local reputations for the medicinal virtures of their waters and are places of considerable resort by both health and pleasure seekers. Their waters are used principally for drinking, though some of them are used also for bathing purposes. The waters of most of them would not stand bottling or shipment, because they loose the best of their medicinal properties on standing. They are mostly of sulphur and chalybeate waters, though many of them doubtless have other mineral substances in solution. The best known of these springs or those which are prepared to take care of visitors, are as follows:—

(1) *White Sulphur Springs, DeKalb county, in the Black*

Shale (Devonian).

(2) *Blount Springs, Blount county, in the Black Shale (Devonian).*

(3) *Saint Clair Springs, St. Clair county, in the Coosa Shales.*

(4) *Shelby Springs, Shelby county, in the Montevallo (Variegated) Shales.*

(5) *Talladega Sulphur Springs, Talladega county, in the Pelham Limestones.*

(6) *Choco Springs, Talladega county, in the Weisner formation.*

(8) *Chandler Springs, Talladega county, in the Talladega Slates.*

(9) *Peidmont Springs, Calhoun county, in the Weisner formation.*

(10) *Mentone Spring, DeKalb county, in the Coal Measures.*

The first six and best known of these springs are sulphur springs, the other four are chalybeate springs. The sulphur springs however have more or less iron in their waters. Many other chalybeate and other mineral springs occur in this region whose waters are doubtless just as good as some, at least, of those of the above springs, though they are not so well known and have no facilities for taking care of visitors. Several of the above springs bottle and ship their waters. The Mineral Resources of the United States for 1894 states that the 4 Alabama mineral springs reporting shipped, during 1894, 12,012 gallons, valued at $12,809. The White Sulphur Springs, DeKalb county, was one of the principal of these 4 reporting springs; the other three are in the newer formations of the State.

CHAPTER IV.

SOILS, AGRICULTURAL FEATURES, TIMBER, WATER-POWER, CLIMATE, HEALTH, RAINFALL, AND DRAINAGE.

The soils, agricultural features, timber, climate, and rainfall of any region are much more important to the people, as a whole, of that region than are its mineral wealth, however great the latter may be, for they deeply concern every individual of that region, whereas the mineral wealth of any region is more or less local in its occurrence and restricted in its personal interest. They are all more or less dependent upon each other and upon the physical features and geological structure of the country. They are therefore especially varied in this region.

SOILS.

The soils of this region, with the exception of those of the Tuscaloosa and Layfayette formations in the south-west part of the region and in detached patches, may be said to have been derived from the underlying rocks and hence to owe their particular characteristics to the nature of the underlying rocks. They are therefore very varied in this region and are in long belts, mostly narrow, with a general north-east and south-west trend, because the underlying rocks are in such belts. They have already been considered in detail, in the Agricultural Report published in 1893, but will now be briefly considered from a different standpoint and classification. They are of the following three general classes:—(1) *Calcareous sandy red loams*, (2) *Slightly calcareous gray sandy soils*, and (3) *Highly calcareous clayey soils*.

(1) *Calcareous sandy red loams.* These loams loams must cover over 2,000 square miles of this region. They are made up of (a) The "red lands" or the red to brown calcareous sandy clayey loams that overlie and are derived from the usually siliceous and cherty dolomites and limestones at the bottom of the Siliceous (Knox) Dolomite and Chert formation, (b) The red to brown calcareous loam of the Red Mountain and Fort Payne Chert formations, (c) The red to brown calcareous loams of the Montevallo (Vareigated) Shales, and (d) The red to brown calcareous loams of the Tuscaloosa and Lafayette formations.

(2) *Slightly calcareous gray sandy soils.* These soils are based on or overlie sandstones, sandy shales, and chert.

They are very important because of their extensive areal surface, They cover over 7,000 square miles of this region. They are made up of (a) The sandy soils of the Coal Measures, (b) The gravelly siliceous soils of the Siliceous (Knox) Dolomite and Chert formation, (c) The sandy soils of the Talladega Slates, (d) The sandy soils of the Weisner formation, (e) The sandy soils of the Oxmoor Shales and Sandstones, (f) The Sandy soils of the Montevallo (Variegated) Shales and Sandstones, and (g) The gravelly siliceous soils of the Fort Payne Chert formation.

(3) *Highly calcareons clayey soils.* These soils cover nearly 1000 square miles of this region. They are made up of (a) The clayey limy loams of the Coosa (Flat-

wood) Shales, (b) The clayey limy loams of the Pelham (Trenton) Limestones, and (c) The heavy limy soils of the Bangor Limestones.

The distribution of these different soils can be best understood from a study of the Geological Map of the State.

AGRICULTURAL FEATURES AND TIMBER.

The agricultural capabilities of this region are very great, notwithstanding that over 1000 square miles of its area are in broken mountains, ridges, and hills, and over 7,000 square miles of its area are of naturally very poor sandy and siliceous soils. The principal crops of this region, as a whole, are Indian corn, cotton, oats, sorghum, millet, wheat, field peas, sweet potatoes, etc., with some clover and grasses. The food crops are on the increase. The soils and climate however are suitable for a much greater diversity of crops. The winters are so slow of approach that frequently the crops are not all gathered until about Christmas.

The timber is still in many places in large forests of soft and hard woods. Lumbering is therefore now and will be for many years one of the great industries of this region. According to Dr. Charles Mohr, the highest authority in the State, the native aborescent growth comprises over 125 species, and the grasses that grow without cultivation over 150 species, and the plants of more or less nutritious value that are relished by stock and that are suitable for forage and hay crops are over 50 in number.

The agricultural features and timber or prevailing growth of any region are closely dependant on the soils of that region or the underlying geological strata. In other words, if the underlying strata are sandstones, the prevailing large growth is pines, and, on the other hand, if the underlying strata are limestones, the prevailing large growth is of the hard woods, So the outcrops of each geological formation may be said to have its own peculiar growth and so distinct are their peculiarities in many cases that the underlying geological formations can be told by the growth. The consideration of the agricultural features and timber of this region will therefore be divided into three different heads that are dependant on the three general classes of soils, as follows: (1) *Agricultural features and timber of the calcareous sandy red loams*, (2) *Agricultural features and timber of the slightly calcareous gray sandy soils*, and (3) *Agricultural features and timber of the highly calcareous clayey soils.*

(1) *Agricultural features and timber of the calcareous sandy red loams.* These are preeminently the farming lands of this region. They are not only naturally fertile or rich in all plant food but they are also susceptible of the greatest improvement and are most retentive of all manures placed on them. They, as a general thing, lie well and hence do not wash badly. They, therefore, if properly cared for, ought not to wear out but ought to improve with age or cultivation. Their timber is large and well shaped, but there is very little of it left, as nearly all their lands have been in cultivation for a great many years.

The "red lands" of the Siliceous (Knox) Dolomite and Chert formation cover some 400 square miles of this region. They have interbedded angular cherty nodules and a sub-soil that closely resembles the soil when free of vegetable matter. They make the best farming lands of this region. They form the Coosa Valley proper, the Talladega Valley, the Alexandria Valley, etc. Their timber consists of red, post, Spanish, white, and blackjack oaks, hickory, short leaf pine, sweet and sour gum, poplar, etc.

The red to brown loams of the Red Mountain and Fort Payne Chert formations are usually very red or ferruginous and very fertile, but they are not of very much agricultural value because they are only in small irregular detached patches on steep mountain and ridge sides. They do not cover as much as 100 square miles of this region. Their timber consists of poplar, white oaks, chestnuts, hickory, red oaks, etc.

The red to brown loams of the Montevallo (Variegated) Shales are also in irregular detached areas. They do not cover over 50 square miles of this region. They frequently form undulating or slightly rolling valleys of fertile and very desirable farming lands. Their timber is of chestnuts, red and white oaks, hickory, etc.

The red to brown loams of the Tuscaloosa and Lafayette formations are known to cover over 1000 square miles of the strata of this region. They are naturally fertile and well drained. They, however, wash badly, though they are in many places in beautiful level tracts that are well adapted to farming. Their timber is of long and short leaf pines, black jacks, Spannish and scarlet oaks, hickory, etc.

(2) *Agricultural features and timber of the slightly calcareous gray sandy soils.* These soils, though as a general thing they are naturally poor, being deficient in organic matter and lime, are fine horticultural, fruit, and grass growing soils. They grow especially well almost all kinds of root crops and they make fine natural pastures. They are well drained and often so lie as to be susceptible of great improvement. By the frequent light applications of suitable composts, they in many

localities become very desirable farming lands. They are still covered for the most part by their native growth.

The sandy soils of the Coal Measures cover some 4,800 square miles of this region. They have been sufficiently described in Part I of this Report.

The gravelly siliceous soils of the Siliceous (Knox) Dolomite and Chert formation are of a badly broken country of hills and ridges. They cover over 1000 square miles of this region. They are usually of a gray color and are sometimes so free of vegetable matter as to be almost white. They are commonly rocky or full of angular cherty gravels and nodules. They are but little in cultivation, because of their sterility, though the gravelly and rocky soils are in many spots very productive. The timber is of long and short leaf pines, Spanish and blackjack oaks, etc. Some of the long leaf pine forests are very extensive and of very fine timber. Some of these forests have been cut down over large areas to feed the saw mills and charcoal furnaces.

The sandy soils of the Talladega Slates cover some 500 square miles of this region. They have been derived from sandy shales with some interstratified sandstones and are of a very broken and wild country. Because of their sterility and the brokenness of their country, they are but little in cultivation. Their timber is of long and short leaf pines and dwarf oaks, with some hickories, post and Spanish oaks.

The sandy soils of the Weisner formation cover about 200 square miles of this region. They are confined to broken mountains and are for the most part rocky, shallow, and sterile. They are therefore tillable in only a few small isolated spots and hence are of but little agricultural value. They however form fine natural pastures and are good for orchards and vineyards. Their timber is of mountain oaks, black-jacks, and Spanish oaks, chestnuts, long and short leaf pines, etc.

The sandy soils of the Oxmoor Shale and Sandstone formation cover some 200 square miles of this region. They are usually of a light gray color and of inferior fertility. They form broken countries that are made up of ridges of sandstones and valleys of shales. They are but little in cultivation and are of comparatively little agricultural value. They are poor and in many places are so badly drained as to be cold and wet. Their timber consist of long and short leaf pines, dwarf oaks, etc.

The sandy soils of the Montevallo (Verigated) Shales and Sandstones cover some 150 square miles of this region. They are of a broken country of sharp ridges and hills separated by narrow irregular undulating and broken valleys. Their soils are usually poor. Their timber is of chestnuts, red and white oaks, dogwood, hickory, etc.

The gravelly siliceous soils of the Fort Payne Chert formation cover nearly 200 square miles of this region. They are in long narrow belts with a general north-east and south-west trend. They are usually fertile, but are little in cultivation, because of their being shallow and rocky and on steep hill sides. Their timber is of black-jacks, post, Spanish and red oaks, hickory, etc.

(3) *Agricultural features and timber of the highly calcareous clayey soils.* These soils overlie and are derived from argillaceous limestones and calcareous shales. They are just the opposite in their agricultural features to the class of soils last mentioned. They are fertile enough but they have too much lime and frequently too much vegetable matter for their good. They vary in

color from a light yellowish gray to an almost black. They are often so badly drained as to be cold and heavy. They are therefore disagreeable to cultivate, being very hard when dry and very soft and sticky when wet. They are therefore but little in cultivation and are for the most part still in their native growth.

The clayey limy loams of the Coosa (*Flatwood*) *Shales* cover over 600 square miles of this region. They are mostly of a heavy,cold, yellowish clay loam that is deficient in organic matter and is in many places so flat over extensive areas as to make drainage impossible. Its extensive flat areas, kown as "flatwoods," are but little in cultivation. The timber is black-jacks, post and red oaks, short leaf pine, etc. Red cedar abounds where the rocks are naked or almost so, and long leaf pine is the principal timber where there is a covering of recent sands and pebbles.

The clayey limy loams of the Pelham (*Trenton*) *Limestones* are from red to brown to black in color. They cover some 250 square miles of this region. They are fertile but are frequently not in cultivation because of their heaviness, coldness, and want of drainage in many places, and because of their shallowness or the closeness of the rocks the surface in many other places. The timber is red, black, and white oaks, maples, chestnuts, hickory, ash, cedar, etc.

WATERPOWER.

The waterpower of the lasting streams of this region is great. There are few of the streams that would not give 8 to 10 feet head of water every few miles, to say nothing of the shoals and water falls of considerable height that occur along many of them. These streams, with their abundance of water and rocky bottoms and sides. present, at many of the shoals and water falls, splendid sites for the erection of machinery of great magnitude. The shoals and water falls perhaps are the most numerous and greatest along the streams as they pass over the hard strata of the Coal Measures and Talladega Slates, though they are made by the hard strata of all the formations.

This power, and it is great, is allowed to run to waste with the exception of some little of it that is used to run small grist mills. The day, however, is doubtless not very far distant when some of it will be coverted into electricity and transmitted, for perhaps miles, to the factories and larger cities. The Coosa and Warrior rivers alone, if bridled as they leave this region, would doubtless give enough electric power to easily run all the machinery of the State. Plate XIII is of the Warrior River near the foot of the shoals as it leaves this region and Plate XI is of a fall over the lower hard strata of the Coal Measures.

CLIMATE AND HEALTH.

Climate.—This region lies between latitudes 32 deg. 55 min. and 34 deg. 50 min. Its climate is mild and equable. It never experiences the extremes of heat and cold of some of the more northern states. It is never too hot during the summer nor too cold during the winter to stop out-door work. The summers, though long, rarely ever reach a temperature of 100 deg F., the mean summer temperature being about 75 deg. F. Sunstrokes are almost unknown. The winters are short and comparatively mild, the streams of running water never freezing over and ice seldom forming over 1 inch in thickness, and the snow, rarely falling to a depth of over a few inches, rapidly melting. The mean winter temperature is about 42 deg. F.

Health.—The healthfulness of this region is good. It doubtless shows a greater longevity per thousand than many of the populous states farther north. It is mostly elevated and well drained, and so there are comparatively few local causes for malaria and sickness.

RAINFALL AND DRAINAGE.

Rainfall.—This region is highly favored with an abundance of rain and freedom from drouths. Rainy spells and drouths are seldom of long enough duration to seriously affect the agricultural interests. The mean winter rainfall, with melted snow, is about 15 inches, and the mean summer rainfall is about 12 inches.

Lasting springs and wells and streams are common in nearly all parts of the region. It is therefore with few exceptions blessed with an abundance of good water the year round for both man and beast.

Drainage.—The drainage of this region, except in a comparatively few places, is good outside of the *flatwoods*. The streams as a rule have rapid currents. They are guided more or less in their general direction by the geological structure of the country or by the outcropping of the harder strata in ridges and the softer ones in valleys, and hence much the greater part of their courses are from northeast to southwest, the drainage being almost wholly towards the southwest.

SECTION IV.

COUNTY DETAILS.

CHAPTER V.

DE KALB COUNTY.

This county is divided into three unequal parts by Wills Valley (Big and Little Wills valleys), an anticlinal valley from 4 to 5 miles wide that extends through the county from north-east to south-west. These three parts consist of Wills Valley itself and the broad shallow synclinal of Raccoon Mountain to the north-west and the broad shallow synclinal of Lookout Mountain to the south-east. The dip across almost the entire width of Wills Valley or until it changes to a steep north-west dip along the north-west edge of the valley is comparatively gentle and to the south-east. The strata with the steep dip along the north-west edge of the valley are sometimes more than vertical or are pushed over towards the north-west until they dip on the outcrops to the south-east. A fault accompanies these steep strata in places. The lowest rocks of the county, geologically speaking, are of course in the anticlinal valley. The geological formations exposed in the county are as follows:

(6) *Carboniferous*	(g) *Coal Measures*	100–600 feet
(5) *Upper Sub-carboniferous*	(f) *Bangor Limestones and Hartselle Sandstones*	500–1000 feet
(4) *Lower Sub-carboniferous*	(e) *Fort Payne Chert, (Tuscumbia Limestones and Lauderdale Chert).*	200–300 feet
(3) *Devonian*	(d) *Black Shale*	20–200 feet
(2) *Upper Silurian*	(c) *Red Mountain (Clinton).*	175–700 feet
(1) *Lower Silurian*	(b) *Pelham (Trenton) Limestones*	800–1500 feet
	(a) *Siliceous (Knox) Dolomite and Chert*	2500 feet

(1) *Lower Silurian.* This group with a visible thickness of from 3000 to 4000 feet forms the central

tiful rock that will take a very good polish. It usually has in it some irregular white streaks and specks of cal- part of the anticlinal valley, covering something over 75 square miles of the county. It is made up of the two formations (b) *Pelham* (*Trenton*) *Limestones* and (a) *Siliceous* (*Knox*) *Dolomite and Chert.*

(a) *Siliceous* (*Knox*) *Dolomite and Chert.* This formation with a visible thickness of 2500 feet forms a very broken belt of country from 1 to 3 miles broad that extends clear through the county from north-east to south-west. It has an area of about 55 square miles in the county. Its larger growth consists principally of black jacks, post oaks, and short leaf pine, though some of its larger trees are of red, black and chestnut oaks, hickories, black and sweet gums, etc. It has the characteristic lime sinks and along its edges many fine springs of sparkling clear lime water. Along its north-west edge in the south-western part of the county, there is a big fault with a vertical displacement in places of near 3,000 feet in which are engulfed nearly all of the strata between this formation and the Upper Sub-carboniferous formation. The surface area of this formation is covered for the most part with piles of loose cherty nodules that occur to a considerable thickness on both the tops and sides of the irregular hills and ridges. Much of this chert is oolitic. Along the edges of this formation, however, there are many outcrops of a light-colored fine grain hard and compact dolomite. This rock is of the upper strata of the formation and is usually cut up into ledges of from 2 to 5 feet each in thickness by inter stratified layers of cherty nodules and interstratified cherty seams. It is also in places so siliceous as to resemble on the weathered outcrops a fine grain sandstone, while in many other places it is a quite pure and beaucite. It shows sometimes, though not often, within the broken belt from under the loose cherty nodules. It has been seen to a maximum thickness of about 50 feet. It may be that the outcrops of this rock on the northwest edge of the belt, along the fault, belong to the bottom of the formation, and that those on the southeast edge of the belt belong to the overlying formation. Some of the fine springs flow from its outcrops. In the upper strata of this formation there has also been seen in places a breccia of angular pieces of chert.

Limonite deposits of this formation have been seen in T. 7, R. 8 E., S. E. ¼ of section 2; N. E. ¼ of S. 21; and S. E. ¼ of S. 20. The ore is in considerable quantity, though it is mixed with loose chert and for the most part is cherty or has in it white chalky spots and streaks of rotton or weathered chert. Much of it, however, is of very good quality and some of it is of very fine needle ore. An averave sample of the deposit in the S. E. ¼ of S. 20, T. 7, R. 8 E., dried at 110 deg. C., gave the following analysis:

Ferric Oxide	69.916
Silica	12.622
Phosphoric Acid	0.197

In the same quarter-section as the ore of S. 2, T. 7, R. 8. E., there is a red or ferruginous clayey rock that looks a good deal like clay-ironstone. It is in irregular streaks or seams. Most of it on being ground up would make very good red ochre, though some of it is too hard and cherty for this purpose and some of it is so irregular in its occurrence as to be of no value. The cherty rocks hereabouts on disintegration give rise to spots of mottled clay, and of a white chalky material that might answer very well for a *tripoli* or polishing powder or for a molding sand.

A row of lime sinks in the N. W. ¼ of S. 5, T. 5, R. 10 E., is supposed by the country people to be the remains of an old mine of some kind.

(b) *Pelham* (*Trenton*) *Limestones.* This formation from 890 to 1500 feet thick occurs in two parallel belts or valleys with a combined area of about 25 square miles. It is made up of the usual gray and blue fossiliferous limestones with some few calcareous shales. These limestones have the interstratified argillaceous seams that show on the weathered outcrops as dirty yellowish clayey looking streaks and splotches. Some of these limestones are striped or banded or made up of alternate gray and blue layers. They usually have white streaks and splotches of calcite. They are commonly quite pure, though some of them are hard siliceous rocks with a cherty look on the weathered outcrops. They usually weather roughly, most often into furrows and ridges. Many of them on weathering become shaly, while others break up into irregular masses and angular gravels. The shales are usually more or less argilliaceous. One of its belts or valleys is just to the north-west of and the other is just to the south-east of the broken belt of Siliceous (Knox) Dolomite and Chert of the central part of Wills Valley. The uppermost limestones of the formation in the south-east belt are usually up on the sides of the ridges to the south-east, and those in the north-west belt are occasionally up on the sides of the ridges to the north-west. The south-east belt or valley of this formation from the more gentle general dip of its strata is much broader than the north-west one. It has an average width of ¼ mile or more. The north-west belt or valley, known in places as the "*Dug-out Valley.*" in a general way, narrow towards the south-west. It is broader at the

Georgia line, where the dip of its strata is comparatively small, from 45 to 50 deg. to the north west, than the other belt or valley or is fully ¼ mile broad, whereas in the south-western part of the county, where its strata are very steep and often more than vertical or pushed over towards the north-west until they have on the outcrops a dip to the south-east, and where the strata of this formation are either partly or wholly engulfed in a fault, it is at best not over 200 yards wide and is in places, as a matter of course, entirely wanting, The strata of both belts or valleys are in wrinkles with a north-east and south-west trend. The outcrops of some of the strata, especially the lower ones, are in places covered with black ferruginous gravels. Some of them are a mere mass of *brachiopods*, *corals*, *graptolites*, and fragments of fossils; and some of them have greenish splotches over their weathered surfaces. They give rise to some fine farming lands, the best in the county, though they form in both valleys, especially along the south-east edge of the south-east valley, some glady places, with a growth of red cedar, persimmon, etc., and a soil that is entirely too shallow and rocky to be cultivated. The upper strata of the south-east valley, principally shales, form in places a kind of flatwoods. Big Wills Creek flows down the south-east valley, usually near its north-west edge.

(2). *Upper Silurian*, (c) *Red Mountain*, (*Clinton* or *Dyestone*) *formation*. This formation forms a narrow belt on each side of Wills Valley. These belts together cover comparatively little surface area not much over 10 square miles, though the formation, from an economic standpoint, is the most important one in the county. Its strata, from 175 to 700 feet thick, carry in places from 6 to 8 different seams of red ore. The south-east belt (East Red Mountain) is usually the broader of the two from the more gentle general dip of its strata. The north-west belt [West Red Mountain] in the south-west part of the county is in a few places entirely wanting, from its strata being wholly engulfed in a big fault, and in many places it is partly narrowed down from its strata being partly engulfed in this fault.

(A) *The north-west belt,* (*West Red Mountain.*) This belt has in it on the south-west or near the Etowah county line from 3 to 4 different seams of ore. These seams are here, however, badly broken up by faults and wrinkles in the strata, especially in spots. Over these spots loose pieces of ore are thickly strewn over the surface. These several ore seams are believed to be the split portions of two regular seams and to come together and make these two regular seams both to the south-west and north-east. Near the county line in the S. E. ¼ of S. 4, T. 10, R. 6, E., there is the following outcropping:

Outcropping in the S. W. Corner of S. E. ¼ of S. 4, T. 10, R. 6, E.

(5)	Shale.		
(4)	*Ore;* shaly	1 ft.	6 in.
(3)	Shale	2 ft.	0 in.
(2)	*Ore*	1 ft.	0 in.
(1)	Shale.		

At this outcropping, the strike seems to be N. 10 deg. E. and the dip about 60 deg. to the ESE. The above outcropping is on the north side of a trench along which there has been a break in the strata. On the south side of this trench and some 16 feet under an outcropping of ore, believed to be the same as that of the above section or as that on the north side of the trench, pushed over to the north-west a distance of some 6 ft., there is about 6 inches in thickness of ore with a dip of about 70 deg. to the south-east. A little further to the nort-east, there is the following outcropping:

Outcropping in the S. W. ¼ of S. E. ¼ of S. 4, T. 10, R. 6, E.

(5)	Shale.		
(4)	*Ore;* good	0 ft.	8 in.
(3)	Shale	15 ft.	0 in.
(2)	*Ore*		10 in.
(1)	Shale.		

The dip of (4) appears to be about 60 deg. to the south-east and that of (2) from 70 deg. to 75 deg. to the south-east.

A little farther to the north-east there is an old test pit in which the strata are again broken, and those on one side of the pit pushed farther to the north-west than the corresponding ones on the opposite side. The ore in this old pit is good and soft or well leached and is said to be about three feet thick. It has been used to a considerable extent for the glazing of stone ware, jugs, flower pots, etc.

The ore ridge along here is broad and is cut up by little hollows into two ridges. Of these two ridges, the strata of this formation form the whole of the south-east one and the south-east side of the north-west one which is capped and covered on the north-west side by overlying strata.

There appears to be some half dozen different ore seams in the S. W. ¼ of S. E. ¼ of S. 4, T. 10, R. 6, E. They are all comparatively thin and are doubtless due to the splitting up of the two regular seams to be seen farther to the north-east and south-west. In one of the outcroppings, the ore is about 15 inches thick and is of good quality. Its strike is about N. 10 deg E. and its dip is about 75 deg. to the WNW. In an other place there is the following outcrop:

Outcropping in the S. W. ¼ of S. E. ¼ of S. 4, T. 10, R. 6, E.

(5)	Shale; visible	5 ft.	0 in.
(4)	*Red ore;* good and soft	1 ft.	3 in.
(3)	Shale	8 ft.	0 in.
(2)	*Red ore;* good and soft	1 ft.	3 in.
(1)	Shale.		

Over this last outcropping 75 to 100 feet, is an other seam of ore that is apparently thin. The strata here are in sharp waves and wrinkles with a north-east and south-west trend; they are bent over to the north-west until on the outcrop they are more than vertical or have a dip of 80 to 85 deg. to the ESE.

In a gully some 400 yards to the south-east of Mr. I. I. Davis', in the S. W.¼ of N.E. ¼ of S. 34,T. 9, R.6,E., there is an outcrop of yellow and varigated shales that have a dip of about 65 deg. to the north-west, and, about 75 yards south of Mr. Davis', there is an outcrop of a seam of red ore of about 2 feet thick. Between these outcrops of shale and ore, there is scattered over the surface, principally in piles or spots, a good deal of good red ore with a slick or greasy feeling. These loose pieces of ore are very fossiliferous. The fossil impressions in many of the worst weathered specimens are completely obliterated and there is only left some straw colored specks and streaks to tell of their former existence.

At Mr. M. N. Gilbreth's in the N. W. ¼ of S. W. ¼ of S. 26, T. 9. R. 6. E., there are at least three different seams of red ore. One of these seams, in an old pit just to the north-east of his house, shows to a thickness of about 2 feet. Its strike is here about N. 55 deg. E. and its dip some 30 deg to the north-west. Two other seams crop out some 50 yards farther to the north-east. The bottom one or more south-eastern of these two is about 4 feet thick, though its ore is of poor quality, being shaly and being cut up by shale partings. The other of these two seams is some 12 to 14 feet farther to the north-west; it is of solid soft ore of good quality, though it is only about 4 inches thick. These last two outcrops are more than vertical or are bent over to the north-west until the dip is about 85 deg. to the south-east. About 200 yards farther to the north-east, the dip is about 60 deg. to the south-east. At these last several outcrops, the Clinton strata form a low broad ridge or more properly speaking two low ridges with a hollow between them. These ridges die out in about one-fourth mile to the north-east of Mr. Gilbreath's and the Clinton ridge (West Red Mountain) on the north-west side of the anticlinal valley is wanting or is not seen again for some two miles to the north-east. The Clinton strata with its red ore however may be continuous through this gap or it may be that they are cut out wholly or in part by a fault. The next red ore to be seen is some 1 ¼ miles to the north-east. This outcropping occurs in the road in the S. E. ¼ of N. E. ¼ of S. 23, T. 9, R. 6. E. There is a gradual rise from it to the foot of Raccoon Mountain only about 150 yards off. At the foot of this mountain, in the field about 75 yards to the north-east of Mr. B. H. Roden's in in the N. W. ¼ of N. W. ¼ of S. 24, T. 9, R. 6 E., there are some outcrops of a yellowish shale with a streak of from 12 to 15 feet thick of a deep red or furruginous soil that doubtless covers the outcropping of a seam of ore. The strike here is N. 30 deg. E. and the dip is from 60 to 70 deg. to the south-east. In the line of this deep red or ferruginous soil, but a short distance to the north-east, there are shales, and so it is more than probable that there is here a break in the strata between these two places. Some 50 feet to the north of the deep red or ferruginous, soil, there is a good deal of loose red ore scattered over the surface that probably comes from a different seam of ore, though it may be from the same seam pushed to the north-east of the break in the strata farther to the north-west. The south-east dip here is in an opposite direction to that of the Coal Measures up on the side of the mountain, due to a fault between these outcrops and the Coal Meausres.

An outcropping of shaly red ore and of yellowish shale, in alternate streaks, forming a seam about 12 feet thick, shows in the road about 200 yards to the south-west of Mr. E. D. Carnes', in the S. E. ¼ of N. E. ¼ of S. 12, T. 9, R. 6 E. The strike of this outcrop is from N. 40 to 45 deg. E. and its dip is about 85 deg. to the north-west. The Clinton ridge (West Red Mountain) here sets in again. At first, it is a succession, in a row, of long hills or short ridges and then a continuous ridge with the exception of where it has been denuded away into gaps and knolls, etc., the strata being continuous across these gaps to the Georgia line. It is a line of low knolls for about one-fourth of a mile in the eastern part of S. 11, T. 8, R. 7 E. and for about one mile in S. 19, T. 7, R. 8 E and for some distance in the S. E. ¼ of S. 29, T. 4, R. 10 E.

In the above road, about 125 yards to the south-west of Mr. J. L. Yarbrough's in the S. E. ¼ of N. E. ¼ of S, 13, T. 9, R. 6 E., there is an outcrop of a sandy red ore or of a very ferrugious flaggy sandstone about 20 feet thick. It is coarse grained and is in strata of from one-fourth of an inch to two inches in thickness. Its upper six feet is hard and flaggy while the rest of it is soft and friable. Its strike is north-east and its dip is about 300 deg. to the south-east, so it is seemingly bent over badly to the north-west. A little farther up the road to the north-east, there is another outcrop of sandy ore that is probably of the same seam. Between these two outcrops, there is near Mr. Yarbrough's, an outcrops of an argillaceous sandstone that on weathering gives rise to a light colored clay. The shale in its outcrop at Mr. Yarbrough's dips about 60 deg. to the south-east and just to the north-east of Mr. Yarbrough's it is hid under Knox Chert along the north-west foot of the Knox Chert ridges. A thin seam of Clinton ore crops out in the Collinsville road up on the side of these Knox Chert ridges, about 200 yards to the north-east of Mr. Yarbrough's and some 75 yards from the foot of the ridges, with loose Knox Chert above, below and all around. There is therefore a fault here between the Clinton and Knox Dolomite formations, in which they are both perhaps partly engulfed as well as the whole of the Pelham (Trenton) Limestones.

A seam of good soft red ore about 8 inches thick crops out in a flat bottom or little valley about one-fourth mile to the north-east of Mr. Yarbrough's. Just over it there is visible about two feet of shale with streaks of red ore. This outcrop is bent over to the north-west until its dip is about 30 deg. to the south-east. An outcrop of red ore in the side of the Clinton ridge (West Red Mountain) in the N. E. ¼ of S. E. ¼ of S.6, T. 9, R. 7 E., is bent over to the north-west until its dip corresponds closely to the steepness of the ridge, about 20 deg. to the south-east. This out-crop, however, going towards the north-east, gradually gets down the hill and becomes in one place about vertical, where it is badly broken up. In another place a break or fault in the strata can be seen to cross it. It appears to be from 6 to 7 feet thick, though it is cut up by shale partings. A test pit has been dug on it in the N. W. ¼ of S. W. ¼ of S. 5, T. 9, R. 7 E., where it has the following section:

Section in the N. W. ¼ of S. W. ¼ of S. 5. T. 9, R. 7 E.

(7)	Shale	
(6)	*Ore*, Shale; in alternate shreaks	9 to 10 in.
(5)	Shale	3 in.
(4)	*Ore*	1 ft. 0 in.
(3)	Shale, *Ore*; in alternate streaks	1 to 2 in.
(2)	*Ore*; shaly on top	3 ft. 2 in.
(1)	Shale	

In this pit the ore is bent over to the north-west until it has a dip of about 60 deg. to the south-east.

An out-crop of ore said to be 4 ft. 6 in. thick occurs on the side of the ridge in the S. E. ¼ of N. E. ¼ of S. 32, T. T. 8, R. 7 E. Its dip is 60 deg. to 70 deg. to the south-east. In a gully in the north-west corner of S. 33, T. 8, R. 7 E., there is about the following outcropping:

Outcropping in the N. W. Corner of S. 33, T. 8, R. 7 E.

(5)	*Ore*; about	4 ft. 8 in.
(4)	Shale; about	18 ft. 0 in.
(3)	*Ore*; about	4 in.
(2)	Shale	10 to 12 ft 0 in.
(1)	*Ore*; about	8 in.

This outcrop is bent over to the north-west until it has a dip of about 70 deg. to the south-east.

Over an outcrop of red ore about 30 inches thick on the side of the ridge in the south-west corner of S. 28, T. 8, R. 7 E., there is about 15 inches of shale with streaks of ore. This outcrop is bent over to the north-west until it has a dip of about 60 deg. to the south-east. A sandy red ore of very ferruginous sandstone from 15 to 20 feet thick crops out at the foot of the Knox Chert ridges near the north-east of a series of low knolls that form the Clinton ridge (West Red Mountain) in the eastern part of S. 11, T. 8, R. 7 E. This outcrop has a dip of about 85 deg. to the north-west. It is just to the north-west of a fault in which are engulfed the Pelham (Trenton) Limestones. To the north-west of this outcrop about 20 feet, with a yellowish shale between, there is a seam of very ferruginous shale about one foot thick. The above thick sandy red ore seam for some distance to the north-east runs along the lowest part of a little valley between the Knox Chert and Clinton ridges that are here not over 200 yards apart. The strata on the side of the Clinton ridge (West Red Mountain) to the north-west of this little valley dip 75 deg. to 80 deg. to the north-west.

By the side of the Winston Gap road, in an old test pit near the center of the N. E. ¼ of S. E. ¼ of S. 36. T. 7, R. 7 E., there is the following section:

Section near the Center of the N. E. ¼ of S. E. ¼ of S. 36, T. 7, R. 7 E.

(13)	Shale; visible	6 to 8 ft 0 in.
(12)	*Ore*	2 to 3 in.
(11)	Shale	1 in.
(10)	*Ore*	2 in.
(9)	Shale	3 ft. 0 in.
(8)	*Ore*	0 to 3 in.
(7)	Shale	8 in.
(6)	*Ore*; good and soft	10 to 11 in.
(5)	Shale	6 in.
(4)	*Ore*	5 in.
(3)	Shale	3 ft. 6 in.
(2)	*Ore*	2 in.
(1)	Shale; yellowish	

It is about 90 yards to the north-west of this last outcrop to the *Black Shale* (Devonian) and some 70 yards to the south-east to the above sandy seam. So the Clinton strata are here over 160 yards broad. The dip at the last outcropping is about 45 deg. to the north-west.

The strata just over the above thick sandy seam about one mile farther to the north-east or in the N. E. ¼ of N.E. ¼ of S. 30, T. 7, R. 8 E.,here near the top of the Clinton ridge (West Red Mountain) have been pushed over to the north-west until they dip 75 deg. to 80 deg. to the south-east. An outcrop of ore 11 inches thick in the S. E. ¼ of N. W. ¼ of S. 20, T. 7 R. 8 E., is about vertical. To the north-east of this outcrop about 75 yards and some 60 feet to the north-west of its line of outcrop, there is an outcrop of a seam of shaly red ore from 6 to 8 inches thick with a dip of about 85 deg. to the north-west. The Clinton and Knox Chert strata are seemingly in contact in the north-west corner of the S.E. ¼ of S. 20, T. 7, R. 8 E. The above thick sandy ore seam crops out here along the foot of the Knox Chert ridges. It is of course separated from the Knox Chert strata by a fault. The strata here along the top of the Clinton ridge (West Red Mountain) are bent over to the north-west until the dip is about 85 deg. to the south-east, but this dip soon changes to one of 85 deg. to the northwest, in going to the north-east, as at the following outcrop in the N. W. ¼ of the N. E. ¼ of S. 20, T. 7, R. 8 E:

Outcropping in the N. W. ¼ of N. E. ¼ of S. 20, T. 7, R. 8 E.

(8)	Shale; yellowish	
(7)	Shale; *Ore*; in alternate streaks	2 in.
(6)	*Ore*	8 in.
(5)	Shales, Flagstones	5 ft. 0 in.
(4)	*Ore*	6 in.
(3)	Shale	5 ft. 0 in.
(2)	*Ore*; about	1 ft. 2 in.
(1)	Shale	

The following outcrop occurs about 75 yards to the south-east of the *Black Shale* (Devonian) in the N. E. ¼ of S. E. ¼ of S. 16, T. 7, R. 8 E.

Outcropping in the N. E. ¼ of S. E. ¼ of S. 16, T. 7, R. 8 E.

(9)	Shale	
(8)	*Ore*; Shale; in alternate streaks	1 ft. 6 in.
(7)	Shale; ferruginous	1 ft. 6 in.
(6)	*Ore*	4 in.
(5)	Shale	3 in.
(4)	*Ore*	2 in.
(3)	Shale	4 in.
(2)	*Ore*; shaly	6 in.
(1)	Shale	

This outcropping is bent over to the north-west until its dip is about 75 deg. to the south-east.

The big sandy ore seam in an outcrop in the S. E. ¼ of S. E. ¼ of S. 9, T. 7. R. 8 E., shows a thickness of only 6 to 8 feet. The dip here is about 80 degrees to the north-west, though in only 25 to 30 feet to the north-west, at the outcropping of an ore seam 8 inches thick, the dip is about 85 degrees to the south-east, the strata having been bent over to the north-west to this extent. A little farther to the north-east, at the outcrop of an ore seem about 12 inches thick, the strata are about vertical. The big sandy ore seam, near the bottom of the formation, along here and farther to the north-east forms a line of low short ridges and hills to the south-east of the main Clinton ridge, West Red Mountain. This big sandy seam about in the N. W. ¼ of N. E. ¼ of S. 10, T. 7, R. 8 E. occurs along the foot of the Knox Chert ridges, the intervening Pelham (Trenton) Limestones being seemingly wanting or engulfed in a fault. An outcrop of ore shows near the center of the N. W. ¼ of S. 2, T. 7, R. 8 E.; and, near the center of the N. W. ¼ of S. 36, T. 6, R. 8 E., there is an outcrop of a ledge of ore about 20 inches thick that is very shaly and is of no value. It is of a brown color and has a N. E. and S. W. strike with a dip of about 85 degrees to the south-east. A short distance to the north-east of this last outcrop, there shows in an old test pit a streak of ore and shale about 2 inches thick. An irony or very ferruginous seam of shale about 32 inches thick crops out near Mr. Wm. Dean's in the S. E ¼ of S. W. ¼ of S. 19, T. 6, R. 9 E. Under it about 5 feet, with a yellowish shale between, there is a streak of ore from 3 to 4 inches thick, and about 5 feet still lower, with the same yellowish shale intervening, there is another streak of ore from 3 to 4 inches thick.

The big sandy ore seam under Mr. Thos. Scott's house in the S. W. ¼ of S. W. ¼ of S. 9, T. 6, R. 9 E. appears to be from 10 to 12 feet thick. This seam is here called the *brick vein* from a slight resemblance of its weathered nodules, scattered over the surface, to pieces of red bricks. To the south-east of it here 50 to 60 yards, there is an outcrop of a very soft seam of ore, in two benches of about 8 inches each in thickness that are separated from each other by from 2 to 3 inches of shale. On opposite sides of an old test pit, about 4 feet wide, in the north-west corner of the S. W. ¼ of S. W. ¼ of S. 9, T. 6, R. 9 E., there are the following sections:

Sections on Opposite Sides of an Old Test Pit 4 feet wide, in the N. W. Corner of S. W. ¼ of S. W. ¼ of S. 9, T 6, R. 9 E.

1. On S. W. Side of Pit.		*2. On N. E. Side of Pit.*	
(13) Shale, of a dark color.	0 to 2 in.	(13) Shale.	
(12) *Ore*	0 to 2 in.	(12) *Ore*	0 to 1 in.
(11) Shale	1 ft. 4 in.	(11) Shale	12 in.
(10) *Ore*	1 to 2 in.	(10) *Ore*	3 in.
(9) Shale	2 in.	(9) Shale	1 to 2 in.
(8) *Ore*	3 in.	(8) *Ore*	4 to 5 in.
(7) Shale, *Ore*; principally shale	1 ft. 6 in.	(7) Shale	2 in.
		Ore	2 in.
		Shale	7 in.
		Ore	1 in.
		Shale	2 in.
(6) *Ore*	1 ft. to 1 ft. 1 in.	(6) *Ore*	9 in.
		Shale	1 to 2 in.
		Ore	1 to 2 in.

(5)	Shale	4 to 8 in.	(5)	Shale	4 in.
(4)	*Ore*	1 to 4 in.	(4)	*Ore*	3 in.
(3)	Shale	8 to 15 in.	(3)	Shale	1 ft. 6 in.
(2)	*Ore*	streak.	(2)	*Ore;*	streak.
(1)	Shale.		(1)	Shale	

The above two sections of the same ore seam on opposite sides of the same test pit, only 4 feet wide, will serve to show how an ore seam may change within a few feet. On the N. E. side of this pit, there is a slight fault that runs N. W. and S. E. The north-east side of this fault is pushed up some little higher than the south-west side.

A seam of good ore crops out in the N. W. corner of S. 3, T, 6, R. 9 E., about as follows:

Outcrops in the N. W. Corner of S. 3. T. 6, R. 9 E.

(3)	*Ore;* good solid ledge	6 to 16 in.
(2)	Shale	1 in.
(1)	*Ore;* resembling limonite	2 in.

The ore (1) of this last section is very compact, though full of cavities that are filled with red ochre. Its dip is about 85 degrees to the north-west.

A seam of ore from 15 to 18 inches thick, with several thin streaks of ore in the shale just over it, crops out in the N. E. ¼ of N. E. ¼ of S. 26, T. 7, R. 9 E. Over this ore a long distance, there is another seam that shows in its outcrops a solid ledge of ore from 13 to 14 inches thick with more ore, doubtless in thin streaks or seams, in the shale just under it. The lower of these two seams, or the one that is here from 15 to 18 inches thick, shows to a thickness of only 14 inches some ¼ mile to the north-east, where it is a good ore and has a dip of about 75 degrees to the north-west.

Four different seams of ore are to be seen near Mr.

Jno. Berry Lee's in the S. E. ¼ of N. E. ¼ of S. 13, T. 5, R. 9 E. The top one is said to be 30 inches thick; the next one 24 inches thick; the next one 20 inches thick; and the last or bottom one 15 inches thick. Here near Mr. Lee's there is about the following outcropping:

Outcropping in the S. E. ¼ of N. E. ¼ of S. 13, T. 5, R. 9 E.

(13)	*Ore;* reported to be	30 in.
(12)	Debris, Shale, etc., to the south-east for 30 yards.	
(11)	*Ore;* visible only	8 in.
(10)	Debris, Shales, etc., to the south-east for 40 yards.	
(9)	*Ore*	5 in.
(8)	Shale, *Ore*	14 in.
(7)	*Ore;* with perhaps some shale	14 to 15 in.
(6)	Debris, Shale, etc., to the south-east for 35 to 40 yards.	
(5)	Deep Red Soil; ore outcropping	8 in.
(4)	*Ore*	5 in.
(3)	Deep Red Soil; ore outcropping	4 in.
(2)	Shale	2 in.
(1)	Very Red Soil; may cover ore outcropping.	

The dip here is about 80 degrees to the north-west.

On opposite sides of an old test pit, about 4 feet wide, in the S. W. ¼ of S. W. ¼ of S. 7, T. 5, R. 10 E., there are the following sections:

Sections on Opposite Sides of an Old Test Pit 4 Feet Wide in the S. W. ¼ of S. W. ¼ of S. 7 T. 5, R. 10 E.

1. On the S. W. Side of Pit.		*2. On the N. E. Side of Pit.*	
(8) Shale.		(8) Shale.	
(7) Very Red Soil; likely covering outcrop of *soft ore*	6 to 8 in.	(7) Very Red Soil with peices of hard *red ore* that resemble *limonite*	8 to 10 in.
(6) *Ore*, Shale; the ore is shaly	8 to 10 in.	(6) *Ore*; shaly streaks of hard ore that resemble limonite	2 in.
(5) *Ore*; good	5 in.	(5) *Ore;* good	7 in.

(4) Shale	4 in.	(4) Soil with hard *red ore* that resembles *limonite*	10 in.
(3) *Red ore;* hard, resembling limonite	5 in.	(3) *Ore* good	8 in.
(2) Very Red Soil; likely covering *soft ore* outcrop	6 to 8 in.	(2) Very Red Soil; likely covering soft ore outcrop	2 in.
(1) Shale.		(1) Shale.	

The last two sections also serve to show how a seam of ore may chang within a few feet. The dip here is about 85 degrees to the north-west.

On the side of a hill, in a road, in the S. E. corner of N. W. ¼ of S. E. ¼ of S. 7, T. 5, R. 10 E., there is the following outcropping:

Outcropping in the S. E. Corner of N. W. ¼ of S. E. ¼ of S. 7, T. 5. R. 10 E.

(5) Shale.	
(4) *Ore*	8 in.
(3) Shale	4 ft. 0 in.
(2) *Ore*	6 in.
(1) Shale.	

The dip at this outcrop is about 85 degrees to the north-west. Higher up the hill or road some 20 yards, there is an outcrop of ore about 2 inches thick, some 10 feet still higher up the road there is an outcrop of another streak of ore. Away down the hill or below any of the above outcrops, there is said to be still another seam of ore.

An outcrop of ore in the S. E. ¼ of N. E. ¼ of S. 6, T. 5. R. 10 E. is said to be from 18 inches to 2 feet thick.

About 120 yards to the south-east of the *Black Shale* (Devonian) in a gap in the N. W. ¼ of S. E. ¼ of S. 29,

T. 4, R. 10 E., there is the following outcropping:

Outcropping in the N. W. ¼ of S. E. ¼ of S. 29, T. 4, R. 10 E.

(6) Shales; hard, crossing the creek in ledges	25 to 30 ft.
(5) Sandstones	4 ft.
(4) Debris	10 to 12 ft.
(3) *Limy Ore or Ferruginous Limestone*; the lower 4 feet is more ferruginous than the rest of the seam, which has in it about 1 foot of shaly limestone	12 ft.
(2) Red Soil	4 to 6 ft.
(1) *Limy Ore or Ferruginous Limestone;* more ferruginous in some streaks than other places, very poor in iron	20 ft.

This outcrop may correspond to the big sandy seam. Its strike is N. 25 degrees E. and its dip is about 85 degrees to the north-west.

Three different seams of red ore with an average thickness of 3 feet are said to be in S's. 29 & 28, T. 4, R. 10 E. In the S. E. ¼ of N. E. ¼ of S. 29, T. 4, R. 10 E., there is an outcrop of ore about 35 inches thick that has just above it about 3 inches and just below it about 5 inches of a deep red loam that may cover soft ore. To the south-east of this last outcrop about 50 yards, there is a test pit with the following section:

Section in the S. E. ¼ of N. E. ¼ of S. 29, T. 4, R. 10 E.

(4) Shale.	
(3) *Ore*	2 ft. 6 in.
(2) Shale, Debris	6 to 8 ft.
(1) *Ore*	1 ft. 6 in.

The ore (1) of this section is doubled or bent over on itself. To the south-east of this outcrop some 75 yards, there is a good deal of loose ore scattered over the surface that must come from an other seam. Some 300 yards farther to the north-east, there is the following outcropping:

Outcropping in the S. E. ¼ of N. E. ¼ of S. 29, T. 4, R. 10 E.

(12) Shale.	
(11) Very Red Soil; most probably covers *soft ore*	4 in.
(10) *Ore* shaly	2 ft. 2 in.
(9) Very Red Soil; probably covers *soft ore*	4 in.
(8) Shale	1 ft. 6 in.
(7) Debris, doubtless covering shales	12 to 15 ft. 0 in.
(6) Very Red Soil; probably covering *soft ore*	4 to 5 in.
(5) *Ore* shaly	1 ft. 6 in.
(4) *Ore*; good and compact	1 ft. 2 in.
(3) *Ore*; shaly	10 in to 1 ft. 3 in.
(2) Very Red Soil; probably covers *soft ore*	4 to 5 in.
(1) Shale.	

Some 75 yards still farther to the north-east, the lower seam, it is believed, of the above section shows as follows:

Outcropping in the S. E. ¼ of N. E. ¼ of S. 29, T. 4, R. 10 E.

(4) Shale.	
(3) *Ore;* about	3 ft. 2 in.
(2) *Ore;* Shale	1 ft. 0 in.
(1) Shale.	

The dip of this outcrop is about 75 degrees to the north-west. This same seam, as it is believed, in an outcrop about 75 yards farther to the north-west, shows as follows:

(6) Shale.	
(5) Very Red Soil, Shale; the soil probably covers soft *red ore*	1 ft. 0 in.
(4) *Ore*	2 ft. 2 in.
(3) Shale	2 to 3 in.
(2) Very Red Soil; probably covers soft *red ore*	6 in.
(1) Shale.	

The dip at this outctop is about 80 degrees to the north-west. The seam just over this one, as it is believed, crops out about ¼ mile to the north-east, thus:

(5) Shale.	
(4) *Ore;* about	21 in.
(3) Shale	8 to 10 in.
(2) *Ore*, Shale	4 in.
(1) Shale.	

A seam just over this last one or the upper one of three seams, as it is believed, shows in an outcrop in the S. W. ¼ of N. W. ¼ of S. 21, T. 4, R. 10 E., a thickness of 3 ft. 6 in. with shale both above and below it. Its dip is 80 degrees to the north-west.

The lowest two of the above three seams in their outcrops in the N. W. ¼ of N. E. ¼ of S. 21, T. 4. R, 10 E., show as follows:

Outcropping in the N. W. ¼ of N. E. ¼ of S. 21, T. 4, R. 10 E.

(9) Shale.	
(8) Very Red Soil; probably leads back to *soft red ore*	6 to 8 in.
(7) *Ore*	1 ft. 3 in.
(6) Debris; most likely covers shale	8 to 9 ft. 0 in.
(5) Shale; visible	4 to 5 ft. 0 in.
(4) *Ore;* good	1 ft. 9 in.
(3) *Ore;* shaly, not good, of a dark color	3 to 4 in.
(2) *Ore;* soft and dirty	8 to 10 in.
(1) Shale: visible	4 ft. 0 in.

The dip of this outcrop is some 75 degrees to the north-west.

In some old diggings in the south-east corner of S. 16, T. 4, R. 10 E., there is the following outcropping:

Outcropping in the S. E. Corner of S. 16, T. 4, R. 10 E.

(6) Debris, *Ore;* the ore is in loose pieces in the debris.	3 to 4 ft. 0 in.
(5) *Ore;* Very Red Soil; very likely all *soft ore*	10 to 12 in.
(4) Shale	1 ft. 2 in.
(3) Very Red Soil; very probaly covers *soft ore*	2 ft. 6 in.
(2) *Ore;* good	1 ft. 2 in.
(1) Soil.	

At this outcrop, the strata are about vertical. This same seam, in an outcrop some 50 yards farther to the north-east, is as follows:

(10)	Shale.	
(9)	*Ore;* soft and friable, in loose grains like those of a very sandy loam	1 ft. 0 in.
(8)	*Ore;* hard and good	6 in.
(7)	Shale	1 to 2 in.
(6)	*Ore*	1 to 2 in.
(5)	Shale	1 in.
(4)	*Ore;* soft like loam	1 ft. 2 to 3 in.
(3)	Shale, *Ore;* the two are mixed	2 in.
(2)	*Ore;* good soft like loam	8 to 10 in.
(1)	Shale.	

The dip of this outcrop is about 80 deg. to the north-west.

Along the wagon road in the S. W. ¼ of S. W. ¼ of S. 15, T. 4, R. 10 E., there are the outcrops of four different seams of ore. There is a considerable distance between the top one and the one next to it; the outcrops of the two middle seams are about 30 yards apart, and from 15 to 18 feet under the lower of them is the bottom seam, about two inches thick.

At the Alabama White Sulphur Springs, in the south-west corner of S. 10, T. 4, R. 10 E., there occurs something like the following general section:

Alabama White Sulphur Springs' Outcropping,
in the S. W. Corner of S. 10. T. 4, R. 10 E.

(11) *Black Shale*; Devonian.
(10) Clinton Strata; to the S. E. for about 250 yards.
(9) *Ore;* with shale partings, about 4 feet thick.
(8) Strata; to S. E. for 40 to 50 yards.
(7) *Ore Seam;* about 2 feet thick.
(6) Strata; to S. E. for 150 yards.
(5) *Ore Seam;* a good soft ore about 3 feet thick.

(4) Strata; may have some ore in them, to S. E. for 100 yards.
(3) *Ore Seam;* seemingly about 18 inchs thick.
(2) Strata; 15 to 20 feet thick.
(1) *Ore Seam;* seemingly about 3 feet thick.

In this outcropping, the upper strata dip about 25 deg. to the north-west and the lower ones about 35 deg. to the north-west; these dips however vary a good deal. In a gully near the School House at these Springs, the ore (9) of the above general section crops out as follows:

(11)	Shale.	
(10)	*Ore;* a little shaly, about	8 in.
(9)	Shale	3 to 4 in.
(8)	*Ore;* soft	10 in.
(7)	Shale	2 in.
(6)	*Ore;* shaly in places	1 ft. 4 in.
(5)	Shale	2 in.
(4)	*Ore;* with soft dirty streaks	1ft. 6 in.
(3)	Shale	3 ft 6 in.
(2)	Shale *Ore;* principally a curly shale	3 ft. 0 in.
(1)	Shale.	

The dip at this last outcrop is about 45 deg. to the north-west. To the south-west of it about 250 yards, there is in a gully an outcropping of the ore (7) of the above genearl section as a good *hard* or *limy ore* 2 feet thick. Its dip is about 30 deg. to the north-west. To the south-east of this last outcropping some 150 yards, the ore (5) of the above general section shows itself as a good *soft ore* that is reported to be 3 feet thick. Near the line of outcrops of this last seam of ore, there shows in the wagon road from the Springs to the railroad station a streak of ore about 2 inches thick, that is doubtless a part of of the same seam. To the south-east of this outcropping in the road about 100 yards, the lowest two seams of the above general section show in the road as follows:

Outcropping in the Wagon Road from the Alabama White Sulphur Springs to the Station on the Alabuma Great Southern Railroad.

(3)	*Ore;* seemingly about	1 ft. 6 in.
(2)	Debris, Shale; about	12 ft. 0 in.
(1)	*Ore;* seemingly about	3 ft. 0 in.

The dip at this outcropping is about 35 deg. to the north-west.

The ore (1) of the above general section in some old surface diggings in the S. W. ¼ of S. E. ¼ of S. 10, T. 4, R. 10, E. shows to a thickness of about 3 feet. It is said to vary in these old diggings from a thickness of 2 feet to 4 feet. It here has in it some little slate, its dip is about 35 deg. to the north-west. To the north-east of these old diggings a short distance, there are other old diggings in which this same ore is said to be 18 inches thick; and to the south-east of these last diggings some 12 to 15 steps there are still other diggings in which the ore is reported to be about 10 inches thick. The ore seams of these last two old diggings correspond respectively to (3) and (1) of the general section. The upper of these two seams in about ¼ mile to the north-east or in the N. E. ¼ of S. E. ¼ of S. 11, T. 4, R. 10 E., shows as follows:

Outcropping in the N. E, ¼ of S. E. ¼ of S. 11, T. 4, R. 10 E.

(8)	Shale; visible from	8 to 10 ft.
(7)	*Ore;* soft and good	0 ft. 4 to 5 in.
(6)	*Ore;* compact	0 ft. 7 to 8 in.
(5)	Shale, *Ore;* gradually passing into each other	2 to 3 in.
(4)	*Ore;* good	1 ft. 1 in.
(3)	Shale	0 ft. 1 to 2 in.
(2)	*Ore;* good	0 ft. 8 in.
(1)	Shale.	

The dip of this outcrop is about 40 deg. to the north-west. This same seam of ore is believed to be the ore in the old diggings in the N. E. ¼ of N. W. ¼ of S. 11. T. 4, R. 10 E. These old diggings are about ¼ of a mile long and the ore in their south-west end is said to be 30 inches thick, though about their middle, about ¼ mile from the Georgia line, the ore is only about 2 feet thick. All of the above old diggings are on the lowest two seams, (3) and (1) of the general section. The ore of the last mentioned old digging is but a few feet over an outcropping of a thich ledge of soft sandstone that when first quarried can be easily cut into any required shape by means of old axes or saws. This sandstone is used extensively for building chimneys. Its dip as well as that of the overlying ore is about 60 deg. to the north-west. The ore (3) of the general section has been surface dug considerably just across the State line in Georgia.

In Deer Head Cove, the lowest strata exposed in Alabama are of this Red Mountain (Clinton) formation. These strata extend three fourths miles down into Alabama from Georgia. An ore seam about 3 feet thick crops out in this cove near the center of S. 15, T. 3, R. 10 E.; it is naked or is at best covered by but a few feet of shales over an area of some 40 acres. It also crops out near the center of the S. W. ¼ of S. 10, T. 3, R. 10 E., where it covers the surface with large boulders. In the N. W. ¼ of S. 10, T. 3, R. 10 E., near the Georgia line, there is the following outcropping:

Outcropping in the N. W. ¼ of S. 10, T. 3, R. 10 E.

(6)	Debris.	
(5)	*Ore;* good, hard or limy	6 in,
(4)	Loam	3 to 4 in.
(3)	*Ore;* good hard or limy	1 ft. 6 in.
(2)	Debris; most likely covering shales, about	20 ft. 0 in.
(1)	*Ore;* good hard or limy	5 in.

The ore of this outcropping is very fossiliferous; (1) in some of its outcrops is merely a streak of very red loam. The dip here is 25 to 30 deg. to the north-west. An outcrop of ore just over the State line in Georgia is said to be about 3 feet thick.

(B) *The South-east strip* (*East Red Mountain*), *The Red Mountain* (*Clinton*) *Strata on the south-east side of the anticlinal of Wills Valley or between Big and Little Wills valleys.* This south-east Red Mountain (Clinton) ridge for about one-half mile to the south-west of the Georgia line is merely a succession of low knolls that in a short distance within Georgia is completely engufed in a fault. The Red Mountain (Clinton) strata of these low knolls and of the gaps between them form a strip about ¼ mile wide from N. W. to S. E. and have in them from 7 to 8 different streaks or seams of ore. The lowest five of these seams in the outcrops near the center of the N. E. ¼ of S. 23, T. 4, R. 10 E., show as follows:

Outcroppings near the Center of the N. E. ¼ of S. 23, T. 4, R. 10 E.

(11)	*Ore*; with a parting of shale, 3 in. thick near the center	1 ft. 3 in.
(10)	Shale, Debris; the debris most likely covers shale	18 ft. 0 in.
(9)	*Ore*	1 ft. to 1 ft. 2 in.
(8)	Debris, Shale: the debris likely covers shale	15 ft. 0 in.
(7)	*Ore*	1 ft. 0 in.
(6)	Deris, Shale; the debris likely covers shale	30 ft. to 35 ft. 0 in.
(5)	Sandstone; a very persistent fine grain or whetstone ledge	10 in.
(4)	Debris, Shale; the debris likely covers shale	12 ft. to 15 ft. 0 in.
(3)	*Ore*	6 in. to 8 in.
(2)	Debris, Shale; the debris likely covers shale	20 to 25 ft. 0 in.
(1)	*Ore*; reported	

The ore seams of this outcrop are much better or thicker in places than in others, or they have in them what is locally known as "*ore wallows*," which are pockets of unusually thick ore. The lower two seams, (1) and (2) of the above section, dip from 65 deg. to 70 deg. to the south-east. The *big sandy seam* crops out some 100 yards to the north-west of (1) and hence a long ways under (1). There are also here three other ore seams that are considerable higher up in the strata than are any of those of the above section or than (11), the uppermost ore seam of that section. The uppermost or most south-eastern of these three highest ore seams is believed to be here the best ore seam. This best or top ore seam and the one next to it have been dug at intervals from near the center of the N. W. ¼ of S. 26, T. 4, R. 10, E, for some 3 miles to the south-west. The best or top ore seam, as it is believed, in an outcrop in the N. W. ¼ of N. W. ¼ of S. 26, T. 4, R. 10 E., has the following section:

Outcropping in the N. W. ¼ of N. W. ¼ of S. 26, T. 4, R. 10, E.

(7)	Shale; visible	3 to 4 ft.	0 in.
(6)	*Ore*	1 ft.	7 in.
(5)	Shale		2 in.
(4)	*Ore*		6 in.
(3)	Shale; dark color		1 in.
(2)	*Ore*		5 in.
(1)	Loam, *Ore;* very red loam with a little ore, visible to a depth of		8 in.

Down the ridge or to the north-west of this last outcropping some 50 yards, and hence considerably under it, there is an outcrop of ore about 2 ft. 6 in. thick. This out crop is bent over to the south-east until it has a dip of 80 deg. to 85 deg. to the north-west. This outcrop however is believed to be of a local seam or a seam that occurs only in places. An average sample of it dried at 100 deg. C. gave the following analysis:

Ferric Oxide	64.381
Silica	12.964
Phosphoric Acid	0.715

Analyst:—J. L. Beeson.

Still lower down the ridge or to the north-west about 140 yards, and hence a good long ways under the last outcropping, there is an outcrop of another ore seam as follows:

(15)	Debris, Shale; the debris most likely covers shales.	
(14)	Very Red Loam; probably covers a *soft ore*	4 in
(13)	Shale	4 ft 3 in.
(12)	*Ore*; soft or badly weathered, a little clayey	1 to 2 in.
(11)	*Ore*; good	4 in.
(10)	Clay; streak	⅛ in.
(9)	*Ore*	2 in.
(8)	Shale	¼ in.
(7)	*Ore*	11 in.
(6)	Shale	2 in.
(5)	*Ore*	3 to 4 in.
(4)	Shale	¼ in.
(3)	*Ore*; soft and clayey, mining	1 in.
(2)	*Ore*	6 in.
(1)	Shale.	

This outcrop is bent over to the south-east until it is in a curve with a dip immediately on the outcrop of 70 deg. to the north-west, and about 6 feet below the surface of 60 deg. to the south-east. Some ½ mile to the south-west, the top or best ore seam has a dip on the outcrop of 70 deg. to the south-east.

Three different seams of ore crop out in the road leading down the ridge from the Franklin [Ohio] Pottery Company Clay Mines in the N. E. ¼ of N. E. ¼ of

S. 34, T. 4, R. 10, E. These seams split or there branches off from them other seams that have in them "*ore wallows*" or pockets of thick ore. One of these three seams, in an outcrop on a spur that extends out from the main ridge [East Red Mountain] in the S. E. ¼ of S. E. ¼ of S. 27, T. 4, R. 10, E., has the following section:—

Outcropping in the S. E. ¼ of S. E. ¼ of S. 27, T. 4, R. 10, E.

(8)	Shale; may carry some *Ore*.	
(7)	*Ore*	1 ft. 3 in.
(6)	Shale; only in places	1 in.
(5)	*Ore*	5 in.
(4)	*Ore*, Clay; *mining*	1 to 2 in.
(3)	*Ore*	1 ft. 1 in.
(2)	*Ore*, Clay; mining	1 to 2 in.
(1)	Shale.	

This outcrop is bent over to the south-east until its dip is 60 deg. to the north-west. An average sample of its ore from two well leached outcrops, dried at 110 deg. C. gave the following analysis:

Ferric Oxide	80.675
Silica	7.954
Phosphoric Acid	0-538

Analyst:—J. L. Beeson.

To the south-west of the last outcropping about 100 yards, there is a showing of ore 28 inches thick, that, strange to say, has a dip of only about 20 deg. to the south-east. This smallness of dip may be due to either a slide or to a wave in the strata. The dip half way up the ridge above these last outcrops is about 60 deg. to the south-east. The *big sandy seam* along here is at the foot of the ridge or in the edge of the valley. It shows a thickness of 6 to 8 feet and is pushed over to the south-east until its dip is 80 deg. to the north-west. This sandy seam has just under it a blue limestone that is doubtless of the Pelham [Trenton] formation. About 100 yards to the south-west of the road leading over the Clinton ridge [East Red Mountain] at the above clay mines, there is the following outcropping:

Outcropping in the N. E. ¼ of N. E. ¼ of S. 34, T. 4, R. 10, E.

(7)	*Ore;* of same seam as above outcrop on spur.	
(6)	Strata	12 to 15 ft. 0 in.
(5)	*Ore*	2 ft. 4 in.
(4)	Strata; about	210 ft 0 in.
(3)	*Ore;* about	3 ft. 0 in.
(2)	Strata	50 to 55 ft. 0 in.
(1)	*Ore*	1 ft. 6 in.

The top ore seam of this section, [7] is known locally as the *perpendicular seam*, though it and the strata near it in the above outcrop dip about 75 deg. to the south-east. This seam in an outcrop about 100 yards still farther to the south-west shows as follows:

(8)	Shale.	
(7)	*Ore;* good, soft though compact	1 ft. 4 in.
(6)	*Ore;* soft, with probably some clay seams	9 in.
(5)	Shale; variable	2 in.
(4)	Clay mud seam	8 to 2 in.
(3)	*Ore*	5 in.
(2)	Clay; mud streak	Streak.
(1)	Shale.	

This *perpendicular seam* is also called the *mining seam* from the clay, mud or mining streaks that always occur in it. It, as has been seen, is the top ore seam. It varies in thickness from 0 to 5 feet, though most commonly it is from 3 ft. 6 in. to 5 ft. thick. There is here about half-way between this top seam and the top of the Red Mountain [Clinton] ridge an outcrop of good ore that is about 2 ft. 6 in. thick. This ore is only local in its occurence and is not of a continuous seam. The *perpendicular* or *top ore seam* and the next two ore seams under it frequently split or send off branches of ore. These ore branches oftentimes have in them considerable ore, though they are usually of very irregular thickness. They often have in them the "*ore wallows*" or pockets of thick ore. These "*ore wallows*" or pockets of thick ore are said to give sometimes several hundred tons of good ore, before being worked out. These split off branches sometimes start off with a good thickness and always reduce to a considerable extent the parent ore seam.

An outcrop near the center of the S. W. ¼ of S. 34, T. 4, R. 10 E., is as follows:

Outcropping near the Center of S. W. ¼ of S. 34, T. 4, R. 10 E.

(5) Shale, Debris; the debris probably covers shale.	
(4) *Ore;* shaly	1 ft. 0 in.
(3) Shale	4 ft. 0 in.
(2) *Ore;* believed to be about	1 ft. 6 in.
(1) Shale, *Ore;* principally shale.	

The dip of this outcrop is about 45 degrees to the south-east. An average sample of this well leached ore, dried at 100 degree C., gave the following analysis:

Ferric Oxide	67.995
Silica	8.290
Phosphoric Acid	1.507

Analyst:—J. L. Beeson.

To the south-west as far as Fort Payne, the Red Mountain (Clinton) strata are of two ridges with a slight depression or shallow narrow valley between them. The north-western of these ridges are entirely of Red Mountain (Clinton) strata, the lowest strata of this formation, while the south-eastern ridge is only partly of this formation, the uper strata of this formation, being capped by fossil (Lauderdale) Chert. From this south-east ridge, there extends out towards the north-west, points or promontories with but a very thin capping of chert and hence principally of Red Mountains (Clinton) strata. On the sides of these points or promontories for a mile or so to the south-west of the last outcropping, there are outcrops of the top or *perpendicular seam*. In the depression between these ridges, there is at the mouth of an old drift about one-half mile to the south-west of the last outcropping, the following outcropping:

(7) Shale.	
(6) *Ore;* soft, may have some shale in it	8 ft. 2 in.
(5) *Ore;* in flaggy streaks	1 ft. 0 in.
(4) Clay	2 in.
(3) Shale	2 in.
(2) Clay	2 in.
(1) Shale; hard, visible	3 ft. 0 in.

This is likely an outcropping of the top or *perpendicular seam*. This top seam at some old diggings in the depression between the ridges farther to the south-west or near the center of the N. E. ¼ of S. 4, T. 5, R. 10 W., has the following section:

Outcropping near the Center of the N. E. ¼ of S. 4, T. 5, R. 10 E.

(11) Shale, Debris; the debris likely covers shale.	
(10) *Ore;* loose	1 ft. 8 in.
(9) Shale	4 in.
(8) *Ore*	2 in.
(7) Shale	4 to 5 in.
(6) *Ore*	3 to 4 in.
(5) Shale. *Ore;* the ore merely in streaks and only in places	4 in.
(4) Shale; may have streaks of *ore* in places	2 ft. 8 in.
(3) *Ore;* of irreuglar thickness, with streaks of shale in places	0 to 1 ft. 6 in.
(2) Shale; about	4 ft. 0 in.
(1) *Ore;* visible to a depth of from	1 ft. 3 in. to 1 ft. 6 in.

The dip of this outcrop is about 45 degrees to the south-east. Some 4 to 5 feet under it, there is another seam of ore that has been worked in places. It is probably a branch of this same seam. The next ore seam under this ore has also been worked in places. The Red Mountain (Clinton) strata in S's 17 & 20, T. 5, R. 10 E. are for the most part in the depression and knolls to the north-west of the main ridge or mountain which is here mostly of Sub-carboniferous strata.

On one of the knolls in the S. W. ¼ of S. E. ¼ of S. 17, T. 5, R. 10 E., there is an outcrop of good solid, though *soft* ore about 13 inches. Just under this ore, in a very red loam, there is a showing of 6 inches of ore. To the south of these outcrops about ¼ mile or in the N. W. corner of the N. E. ¼ of S. 20, T. 5, R. 10 E., there is an outcrop of ore that is darker and harder and not so good and seemingly thiner. It appears to be about vertical. At some old diggings in the S. W. ¼ of S. 19, T. 5, R. 10 E., there occurs the following section:

Outcropping in the S. W. ¼ of S. 19, T. 5, R. 10 E.

(4) Shale; visible several feet.	
(3) *Ore;* good and soft	1 ft. 2 in.
(2) Clay; red color, mining	1 in.
(1) *Ore;* hard and compact like limonite	½ in.

The *big sandy seam* crops out along the foot of the ridge in the N. W. ¼ of S. W. ¼ of S. 31, T. 5, R. 10 E. and in the road in the S. E. ¼ of N. W. ¼ of S. 30, T. 5, R. 10 E. It is in two ledges of about 6 feet each in thickness that are separated from each other by about 10 feet of shale. Its dip is 35 degrees to 40 degrees to the south-east.

An outcrop of ore about 8 inches thick occurs in the N. E. ¼ of S. 36, T. 5, R. 10 E., and in a ravine in the S. W. ¼ of N. E. ¼ of S. 1, T. 6, R. 9 E., there is the following outcropping:

Outcropping in the S. W. ¼ of N. E. ¼ of S. 1, T. 6, R. 9 E.

(9) Debris.	
(8) *Ore;* good, hard ledge, the bottom 1 to 2 inches is like limonite, visible from	7 to 8 in.
(7) Debris; most likely covers shale, about	4 ft. 0 in.
(6) *Ore;* good, hard ledge, visible	6 in.
(5) Debris; most likely covers shale, about	4 ft. 0 in.
(4) *Ore;* good, hard ledge, the bottom 2 inches is so hard and compact as to ring like metallic iron on being struck with the hammer, the upper] part is very fossiliferous	1 ft. to 1 ft. 2 in.
(3) Sandstone; flagstone	4 to 5 ft. 0 in.
(2) Sandstone; shaly, hard and of a dark color	6 ft. 0 in.
(1) Debris.	

The dip of this outcrop is 30 deg. to 35 deg. to the south-east. Just to the south-west of this outcrop, in another ravine, there is the following outcropping:

(12) Debris; shales and sandstones.	
(11) *Ore;* good, hard ledge	6 in
(10) Debris	3 to 4 ft. 0 in.
(9) Debris, *Ore;* the ore loose and in the upper part of debris which doubtless covers an ore seam	4 ft. 0 in.
(8) *Ore;* good, hard ledge, visible	6 to 8 in.
(7) Debris	6 in.
(6) *Ore*	1 to 2 in.
(5) Debris	6 to 8 in.
(4) *Ore*	1 to 2 in.
(3) Debris	6 to 8 in
(2) Sandstone; flagstone	6 to 8 ft 0 in.
(1) Debris.	

The lower Red Mountain (Clinton) strata, in the N. W. ¼ of S. 12, T. 6, R. 9 E., form aseparate and distinct ridge from the fossil chert ridge. They form also the narrow shallow valley or depression between these ridges. Over the south-east side of this separate Red Mountain (Clinton) ridge, in the N. E. ¼ of N. W. ¼ of S. 12, T. 6, R. 9 E., there is a great deal of loose ore.

This loose ore most probably comes from a seam that farther to the south-west crops out near the top of the Red Mountain (Clinton) ridge and has a dip that corresponds closely to the surface or slant of the south-east side of the ridge. The dip near the north-west foot of this ridge is about 35 deg. to the southeast. The *big sandy seam*, as a friable granular rock that shows a thickness of some 20 feet, crops out in the spurs and knolls along the north-west foot of this separate Red Mountain (Clinton) ridge. It, a little farther to the south-west, forms a separate low ride. There are therefore at this point three separate ridges, of which the whole of the north-western two and the north-west side of the south-eastern one are of Red Mountain (Clinton) strata. The south-east ridge, capped with fossiliferous chert, is much the tallest of these three ridges.

A seam of good ore about 8 inches thick, with a streak of ore 4 to 5 feet under it, crops out in the road on the side of the ridge in the S. E. ¼ of N. E. ¼ of S. 11. T. 6, R. 9 E. Its dip is about 35 deg. to the south-east. The Red Mountain (Clinton) strata of this neighborhood are principally shales with a few ledges of a yellow colored sandstone. The sandstone from one of these ledges in the middle ridge in the N. W. ¼ of N. E. ¼ of S. 11, T. 6, R. 9 E., is used extensively by the neighborhood people for building chimneys; it is soft and can be easily cut with an old ax or saw when first quarried but on exposure to the weather it becomes very hard. Over this seam of sandstone 4 to 5 feet there is a seam of ore, but it is believed to be thin. To the south-east of this outcropping some 60 yards, in the hollow between the middle and south-east ridges, there is another outcrop of ore; it is about 15 inches thick and has been surface dug some. From 6 to 8 inches of good *hard ore* shows on the side of the ridge in the N. W. ¼ of N. W. ¼ of S. 14, T. 6, R. 9 E. Its dip is about 30 deg. to the south-east. An outcropping of a bright red ore about 14 inches thick shows in the northern part of the S. W. ¼ of N. E. ¼ of S. 22, T. 8, R. 9 E., and some 200 yards to the south-west there is a ledge of dark brown ore that shows a thickness of 28 inches. This dark brown ore is not of very good quality, it is believed to be under the bright red ore. About ½ mile farther to the south-west or in the south-east corner of the N. W. ¼ of S. 22, T. 6, R. 9 E., there is an outcropping from 15 to 16 inches thick that is of very good ore. Its dip is from 15 deg. to 20 deg. to the southeast. To the southeast of the outcrop of this seam, there is loose ore scattered over the surface that most probably comes from the above seam of dark brown ore. A seam of ore about 6 inches thick crops out in a branch and on the side of a hill in the S. E. ¼ of N. E. ¼ of S. 32, T. 6, R. 9 E. The outcrop in the branch is a ledge of good *hard (limy) ore* while the one on the side of the hill is *soft* ore. There is at least one more ore seam above this one, as there are loose pieces of *hard (limy) ore* up the branch above its outcrop. To the south-west a short distance, there is a reported outcrop of ore from 12 to 20 inches thick. The *big sandy seam* is here from 25 to 40 feet thick, though about 10 feet of this thickness is full of shale partings. This seam on the outcrop is badly weathered, so much so that it is merely a mass of loosely coherent rounded coarse grains of ferruginous sand. Its dip is about 30 deg. to the south-east.

Two seams of ore about 35 feet apart crop out on the north-west side of the ridge opposite Fort Payne. The upper seam in these outcrops appears as several thin streaks of ore through several feet of shale, and the lower seam shows as follows:

Outcropping opposite (north-west of) Fort Payne.

(9)	Shale; visible	3 ft. 0 in.
(8)	*Ore*	3 in.
(7)	Shale	¾ in.
(6)	*Ore*	2 in.
(5)	Shale	½ in.
(4)	*Ore*	8 in.
(3)	Shale, Debris	4 ft. 0 in.
(2)	Sandstone; flagstone	4 in.
(1)	Shale	

The ore of this outcrop is good and *soft*. The dip is about 30 deg. to the south-east. Some 25 feet lower down the ridge there is a streak of several feet in thickness of very red loam that may cover the outcropping of another seam of ore. The *big sandy seam* here forms a line of knolls just to the north-west of the foot of the ridge with a narrow shallow valley or depression between. There is only one ridge here. This sandy seam below the point of weathering is doubtless nothing more than a ferruginous siliceous limestone. It is here about 20 feet thick. Just under it, there is a ferruginous shale about 15 feet thick. In this ferruginous shale are some streaks of yellow shale.

At some old diggings near the center of S. 7, T. 7, R. 9 E., there is the following outcropping:

Outcropping near the Center of S. 7, T. 7, R. 9 E.

(11)	Shale; *Ore*; the ore is only in places and only in streaks in these places	10 ft. 0 in.
(10)	Shale	4 in.
(9)	*Ore*	2 in.
(8)	Shale	½ in.
(7)	*Ore*	2 in.
(6)	Shale	4 in.
(5)	*Ore*	1 to 2 in.
(4)	Shale	4 in.
(3)	*Ore*	2 in.

(2) Shale	12 in.
(1) *Ore*; hard and limy	28 in.

The ore (1) of this section, on the dip from the above old diggings or in the outcrop on the side of a ravine, is *soft* or is well leached. At another plate in these old diggings, though nearer the outcrop, there is the following section:

(3) Shale; visible	4 ft. 0 in.
(2) *Ore*; good soft or well leached with, near its bottom, hollow concretionary nodules or balls with shells of hard compact ore that resembles limonite and with nuclei of red ochre	2 ft. 4 in.
(1) Shale	

The ore (2) of this last section corresponds to (1) of the immediately preceding section. This seam of ore is therefore, in places close together and equally near the outcrop, sometimes *soft* or well leached and sometimes *hard* or limy ore.

Average samples of ore from the above old diggings, dried at 105 deg. C., gave the following analysis:

	(1)	(2)
Ferric Oxide	80.030	37.732
Silica	7.928	3.970
Phosphoric Acid	0.518	0.863
Lime Carbonate	——	53.209

(1) A well leached ore with yellowish ochre looking specks occupying the places of the obliterated fossils. [From the outcrop.] Analyst—J. L. Beeson.

(2) A hard fossiliferous limy ore with some white calcareous spots. [Some 15 feet from outcrop.] Analyst—J. L. Beeson.

About one mile southwest of Fort Payne, at Furnace No. 1 on the northwest side of Little Wills Valley, there is a bored well that is said to have about the following section:

No. 1, Fort Payne.

....	25 ft.
niferous) .	190 ft.
....	10 to 12 ft.
....	340 ft.
limestones *from 6 to 8 feet* ar seams.......	18 ft.
some seams of	50 ft.
Sandstones...	180 ft.
oarse ferruginous	50 ft.
....	40 ft.
Limestones and rian).............	

imy) ore about 13 inches thick. 125 yards below the Fort Payne orner of S. 15, T. 7, R. 8 E. An ore gave the following analysis:

....	42.763
....	50.783
....	3.345
Acid..................	1.119

alyst, J. L. Beeson.

sample was taken, this outcrop has d shown to be a very good seam of r ledge or seam of ore is said to be er this one, as has been shown by a gray sand-stone between them. The orms here a low ridge with a shallow de- n it and the main ridge of Red Mountain Sub-carboniferous strata. This *big sandy* the outcrop is granular or friable and ap- two benches that are separated from each owish shales. The upper bench is from 12 to 15 feet thick and is in waves with a north-east and south-west trend. This *big sandy seam* is here just over a limestone of a dull ashy gray color that lies on Pelham (Trenton) Limestones with clayey looking streaks.

Just to the south-west of this gap in the ridge, there is about the following outcropping:

Outcropping in the S. W. ¼ of S. W. ¼ of S. 7, T. 7, R. 9 E.

(27)	Shales; corresponding to (7) of the above section of well,	
(26)	*Ore*	10 in.
(25)	Shales	8 in.
(24)	*Ore*	3 in.
(23)	Shale	3 ft. 6in.
(22)	*Ore*	9 in.
(21)	Shale	2 ft. 9 in. to 3 ft. 0 in.
(20)	*Ore*	1 ft. 2 in. to 2 ft. 6 in.
(19)	Shale	2 ft. 0 in.
(18)	*Ore*	8 in.
(17)	Shale; about	20 ft. 0 in.
(16)	*Ore*; reported	2 ft. 0 in.
(15)	Shales, Debris; may cover some *Ore*, reported about	37 ft. 0 in.
(14)	*Limy Ore;* very fossiliferous	8 in. to 2ft. 0 in.
(13)	Shales	6 in. to 1 ft. 0 in.
(12)	*Limy Ore*	6 in to 1 ft. 0 in.
(11)	Shales, *Limy Ore*	8 in. to 1 ft. 2 in.
(10)	*Limy Ore;* with red splotches	1ft. 0 in. to 1 ft. 4 in.
(9)	Shales, Sandstones	1 ft. 6 in. to 2 ft 0 in.
(8)	*Limy Ore*	2 ft. 6 in. to 3 ft. 0 in.
(7)	Shale	6 in.
(6)	*Limy Ore*	1 ft. 2 in.
(5)	Shale	2 in. to 0 ft. 3 in.
(4)	*Limy Ore*	6 in. to 0 ft. 8 in.
(3)	Shale	3 ft. 0 in. to 4 ft. 0 in.
(2)	*Limy Ore*	10 in. to 1 ft 0 in.
(1)	Shales, Debris; (4) of the above section of well.	

The ore (20) is of the same seam as the outcrop just below the Fort Payne Mill, of which an analysis is given above. It is here of very good quality and has been mined on an extensive scale. Its *soft* (leached) ore would carry something over 45 per cent of ferric oxide, while its *hard* (limy) ore has from 35 to 40 per cent of ferric oxide.

On Mrs. E. Edward's land in the N W ¼ of N. W. ¼ of S. 24, T. 7, R. 8 E.,, there is the following outcropping:

Outcropping in the N. W. ¼ of N. W. ¼ of S. 24, T. 7. R. 8 E.

(10)	Shales; of a dark color, visible	3 ft.
(9)	*Ore; hard* and limy, variable in thickness and composition	1 ft. 3 in.
(8)	Shale, *Ore;* the ore in streaks in the shale	1 ft. 7 in.
(7)	*Ore; hard* and limy	7 in.
(6)	Shale; dark color	1 ft. 2 in.
(5)	*Ore*, Shale; in places an ore, in other places a shale	2 in.
(4)	Shale; variable in thickness, of a dark color	1 ft. 2 in.
(3)	*Ore;* limy, variable in thickness, and composition	5 to 7 in.
(2)	Shale	2 to 6 in.
(1)	*Ore;*limy and variable in composition	1 ft. 3in.

The dip of this outcrop is about 25 deg. to the south-east.

The ore of this section is *hard* and limy in some of the outcrops and in others it is *soft* or well leached. In the outcrops on the tops of the spurs pointing out towards the the north-west from the main ridge, the ore is *soft* or well leached while in the hollows between these spurs it is *hard* or limy. In the outcrops of *soft* or well leached ore, there are balls or nodules of hard compact ore that resembles limonite. This *soft* ore in several outcrops on the south-west side of a gap in the S. E. ¼ of N. E. ¼ of S. 23, T. 7, R. 8 E., shows a thickness of about

15 inches, with shales both over and just under it. The *big sandy seam* crops out here along the points of the spurs next to the valley.

The ore in the *Baxter old ore beds* in the N. E. ¼ of S. E. ¼ of S. 27, T. 7. R. 8 E., is about 12 inches thick. In these old diggins, there is in one place the following outcropping:

Outcropping in the Baxter Ore Beds in N. E. ¼ of S. E. ¼ of S. 27.
T 7, R. 8 E.

(4)	Shales; visible	4 ft. 0 in.
(3)	*Ore;* limy, merely a red clayey streak in places	5 in.
(2)	Shale	4 in.
(1)	*Ore;* good, limy	1 ft. 0 in.

In another place in these old diggings, there is the following outcropping:

(4)	Shale; visible	4 ft. 0 in.
(3)	*Ore*	2 to 6 in.
(2)	Shale	3 to 4 in.
(1)	*Ore*	1 ft. 0 in.

The ore also of this neighborhood in the outcrops on the spurs is *soft* or well leachedand in those of the hollows between the spurs it is *hard* or limy. It becomes *hard* or limy also on the tops of the spurs as soon as it gets under 4 to 5 feet of cover. Near the the above old diggings of the Baxter beds, there is something like the following general section:

Approximate Outcropping in the N. E. ¼ of S. E. ¼ of S. 27, T 7, R. 8 E

(28)	Debris; with some small loose pieces of a cherty looking sandstone covering the top and upper part of the ridge	15 ft. 0 in.
(27)	Sandstone; forming a ledge, of light gray color	4 ft 0 in.

(26)	Shales, about	75 ft. 0 in.
(25)	Sandstone; flagstone	2 ft. 0 in.
(24)	Shale; about	55 ft. 0 in.
(23)	Shale, *Ore;* the ore is in thin streaks in the shale	10 to 12 ft 0 in.
(22)	Shale; yellow, about	30 ft. 0 in.
(21)	Shales; two deep red or ferruginous streaks of 3 inches each in thickness that are separated from each other by a streak of yellow shale	9 in.
(20)	Shale	10 ft 0 in.
(19)	*Ore;* good, from	1 ft. to 0 ft. 10 in.
(18)	Shale	6 in.
(17)	*Ore*	Streak.
(16)	Shale	1 ft. 3 in.
(15)	*Ore*	4 in.
(14)	Shale	3 ft. 0 in.
(13)	Sandstone; flagstone	4 in.
(12)	Shales, Sandstones; the sandstones occur as one or more thin flaggy seams in the shale,	30 ft. 0 in.
(11)	*Ore;* good	6 in.
(10)	Shales; yellow, about	35 ft. 0 in.
(9)	*Ore;* limy, only in places	2 to 4 in.
(8)	Shale	10 in.
(7)	*Ore;* limy	11 in.
(6)	Shale, *Ore;* the ore is in thin streaks in the shale	20 ft. 0 in.
(5)	Shales; about	100 ft. 0 in.
(4)	*Ore;* limy	1 ft. 6 in.
(3)	Debris; about	40 ft, 0 in.
(2)	*Ore;* so sandy as to be nothing more than a ferruginous sandstone	24 ft. 0 in.
(1)	*Pelham (Trenton) Limestones (Lower Silurian)*	

The *big sandy seam*, (2) has the following section in detail:

(4)	*Ore;* limy	3 ft. 0 in.
(3)	*Ore;* a ferruginous sandstone	8 " 0 in.
(2)	Limestone	1 " 0 in.
(1)	*Ore;* a ferruginous sandstone	12 " 0 in.

The dip here is about 30 deg. to the south-east. In the gap through the ridge at this point, about opposite the new mill, in the S. E. ¼ of S. E. ¼ of S. 27, T. 7, R. 8, E., there is the following outcropping of the strata (9) and (7) of the above approximate section:

Outcropping in the S. E. ¼ of S. E. ¼ of S. 27, T. 7, R. 8, E.

(8)	Debris; loose sandstones.	
(7)	*Ore;* limy, good	1 ft. 3 in.
(6)	Limestone; shaly and ferruginous	1 ft. 0 in.
(5)	*Ore;* limy	2 in.
(4)	Debris; most probably covering shale	3 ft. 0 in.
(3)	*Ore;* limy	2 in.
(2)	Debris	15 ft. 0 in.
(1)	*Ore;* limy, good	6 to 8 in.

A ledge of good limy ore that shows to a thicknes of about 18 inches, though it is said to be 3 feet thick, crops out on the side of the ridge (East Red Mountain) opposite Lebanon, or in the S. ½ of S. E. ¼ of S. 4, T. 7, R. 8, E. Some 200 feet under it there is an outcropping of another seam of ore, shaly, from 8 to 10 inches thick. The strata between these two ore seams are principally of shales with some interstratified ledges or seams of sandstone. About 20 feet under the lower of these two ore seams is a thin seam, about 6 inches thick, of a shally limy ore, and some 100 feet under this thin seam, with shales and debris between, there is the *big sandy seam*. This *big sandy seam* is here a siliceous or sandy granular ferruginous limestone about 20 feet thick. The strata just under it are of a clayey blue limestone, of which the upper 50 feet are more or less ferruginous. Its dip is about 20 deg. to the southeast.

Extensive old ore diggings occur on both sides of the Portersville Gap in the W. ½ of N. E. ¼ of S. 20, T. 8, R. 6, E. The diggings on the north-east side of the gap commence about on a level with the gap and follow the outcropping of the ore as it rises, for near ¼ mile, to its outcrop near the top of the hill (East Red Mountain) some 300 feet above the level of the gap. At equal intervals in these old diggings, commencing at the bottom or on a level with the gap, the following four sections occur:

Section in Old Ore Diggings on N. E. Side of the Portersville Gap in the W. ½ of N. E. ¼ of S. 20, T. 8, R. 8, E.

	(1)	(2)	(3)	(4)
(5) Shale; visible........	15 ft. 0 in.	4 ft. 0 in.	10 ft. 0 in.	10 ft 0 in.
(4) *Ore*....................	1 ft. 3 in.	1 ft. 5 in.	1 ft. 1 in.	1 ft. 1 in.
(3) Shale....	1 ft. 3 in. to 1 ft. 4 in.	1 ft. 4 in.	8 ft. 3 in.	8 ft. 3 in.
(2) *Ore*..........	0 ft. 7 to 8 in.	1 ft. 6 to 7 in.	1 ft. 4 in.	1 ft. 2 in.
(1) Shale, *Ore;* not much ore...		0 ft. 1 to 2 in.	0 ft. 2 in.	9 ft. 2 in.

In section (1) the ore (4) is *soft* in the outcrops on the side of the ridge but *hard* in the outcrops in the bottom part of the gap, and the ore (2) is *hard* [limy]. In section [2] the ore [4] is *soft* and the ore [2] is *hard*. In section [3] both the ore [4] and [2] are *hard* [limy]. In section [4] the ore [4] is *soft* and the ore [2] is *hard* [limy]. The ore of these sections have from 4 to 15 feet of cover and are some 20 feet on the dip from the outcrops. The dip is about 30 deg. to the south-east. The following analysis is of an average sample of the ore at six different places in these old diggings, dried at 100 deg. C.

Ferric Oxide.............	67.290
Silica....................	8.915
Phosphoric Acid..........	1.007

In some old diggings on the opposide or south-west side of the Portersville Gap or near the center of the N. W. of S. 20, T. 9, R. 8. E., there are the following two outcrops:

Sections in Old Diggings on the S. W. Side of the Portersville Gap, or Near the Center of the N. W. ¼ of S. 20, T. 8, R. 8, E .

		(1)	(2)
(7)	Shale; visible............	12 to 15 ft. 0 in.	6 ft. 0 in.
(6)	*Ore*	4 in.	streak.
(5)	Shale......................	1 ft. 2 in.	5 ft. 0 in.
(4)	*Ore*......................	2 in	0 to 1 ft. 2 in.
(3)	Shale......................	2 in.	2 ft. 6 in.
(2)	*Ore*......................	2 in.	8 in.
(1.)	Shale; very ferruginous, visible......................		2 in.

In section [1] the ore [6] is *soft* and good, the shale [5] is dark, and the ore [2] is shaly. In section [2] the ore [2] is good *hard* [limy], and the shale [1] is a poor shaly ore. In an other place in these old diggings, the ore, believed to be [4] of the above two sections, is from 18 to 20 inches thick and is hard [limy].

Near the top of the ridge [East Red Mountain] about a mile to the south-west of the Portersville Gap, there are other old ore diggings on two or more of the seams of the following approximate section:

Approximate Section ¼ Mile S. W. of Portersville Gap.

(10)	Debris.	
(9)	*Ore;* good about......................	8 in.
(8)	Debris......................	4 ft. 0 in.
(7)	*Ore;* good......................	1 ft. 0 in.
(6)	Debris......................	6 ft. 0 in.
(5)	*Ore*......................	4 to 6 in.
(4)	Debris; may hide a seam of *ore*..	15 ft. 0 in.
(3)	*Ore*......................	1 ft. 0 in.
(2)	Debris	4 ft. 0 in.
(1)	Sandstone; ledge	2 ft. 0 in.

The ores (9) and [7] of this section have been surface dug some also about 150 yards farther to the south-west. It is reported that in the N. E. ¼ of S. E. ¼ of S. 19, T. 8, R. 8, E., there are two seams of ore from 15 to 20 feet apart; the upper one is said to be from 8 to 12 inches thick and the lower one from 17 to 24 inches thick. At the McNaren old ore diggings in the S. W. ¼ of S. W. ¼ of S. 19, T. 8, R. 8, E., about opposite to the Wesson Mills, there is the following section:

Section at the McNaren Old Diggings in the S. W. ¼ of S. W. ¼ of S 19, T. 8, R. 8, E.

(10)	Shale	
(9)	*Ore;* shally in places	4 in.
(8)	Shale	2 ft. 6 in.
(7)	*Ore;* visible to a thickness of 1 ft 1 in, thought to be	1 ft. 3 in.
(6)	Debris; about	25 ft. 0 in.
(5)	Shales, Sandstones; the sandstones are thin flags	7 ft. 0 in.
(4)	*Ore*	4 in.
(3)	Shale; hard	6 in.
(2)	Sandstones; flagstones	2 in.
(1)	*Ore;* visible to a thickness of 10 inches, believed to be	1 ft. 10 in.

The dip here is about 30 deg. to the south-east. East Red Mountain is here made up of three ridges; the south-east or main ridge is capped with Sub-carboniferous strata; the other two, properly speaking, being spurs or benches of the main one, are entirely of strata of this [Red Mountain] formation and are separated from each other and from the main ridge by slight depressions or hollows. On the north-west side of the main ridge in the N. E. ¼ of S. W. ¼ of S. 3. T. 8, R. 7, E., there is something like the following outcropping.

Outcropping in the N. E. ¼ of S. W. ¼ of S. 3, T. 8, R. 7, E.

(9)	Shales, Sandstones	60 ft. 0 in.
(8)	*Ore*	6 in.

(7)	Shale, Debris	2 ft. 0 in.
(6)	*Ore*	1 ft. 0 in.
(5)	Debris, Shale; the Shale is ferruginous	2 ft. 0 in.
(4)	*Ore*	2 in.
(3)	Sandstone, Shale, *Ore;* the ore is in thin streaks	20 ft. 0 in.
(2)	*Ore*	1 ft. 6 in.
(1)	Debris, Limestone; the limestone is siliceous and of a dark color.	

Some ¾ of a mile to the south-west or in the S. E. ¼ of N. E. ¼ of S. 2, T. 9, R. 7, E., there are outcrops of two seams of ore that are separated from each other by about 4 feet of shale and debris. These two seams of ore are about 12 inches each in thickness and of good solid *soft* ore. They have been surface dug to a considerable extent. On the side of the ridge just to the north-east of the Collinsville Gap or in the S. E. ¼ of S. 2, T. 9, R. 7 E., there is the following outcropping:

Outcropping in the S. E. ¼ of S. 2, T 9, R. 7 E.

(10)	Shale, *Ore;* the ore is in thin streaks.	
(9)	*Ore*; good and *soft*	8 in.
(8)	Shale	8 to 10 ft. 0 in.
(7)	Shale, *Ore;* the ore in considerable quantity	4 ft. 0 in.
(6)	Sandstone, Debris; about	75 ft. 0 in.
(5)	Shale, Debris; about	30 ft. 0 in.
(4)	*Ore;* limy (*hard*) visible	1 ft. 6 in.
(3)	Debris, Shale; about	18 ft. 0 in.
(2)	*Ore;* a ferruginous limestone	8 ft. 0 in.
(1)	Debris.	

The dip of this outcrop is about 30 deg. to the south-east.

Just to the south-west of the Collinsville Gap, the Red Mountain (Clinton) and Sub-carboniferous chert ridge (East Red Mountain) is broad on top and has a kind of depression on its top that runs with the trend of the ridge. The north-west side of this depression is usually the crest or tallest part of the ridge and is entirely of the strata of the Red Mountain formation, while the portion to the south-east of the depression is capped with and is covered on its south-east side with Sub-carboniferous chert. On the steep north-west side of the ridge in the S. E.¼ of N. W. ¼ of S. 11, T. 9, R, 7 E., there is the following outcropping:

Outcropping in the S. E. ¼. of N. W. ¼ of S. 11, T. 9, R. 7 E.

(11)	Shales, Debris, Sandstones; about	75 ft. 0 in.
(10)	*Ore; soft* and good	1ft 3 in. to 1ft. 4 in.
(9)	Debris, Sandstone; about	15 ft. 0 in.
(8)	Debris, *Ore;* the ore is in considerable quantity but is in loose pieces	10 ft. 0 in.
(7)	Sandstone; of a yellowish color	45 ft. 0 in.
(6)	Shales; about	125 ft. 0 in.
(5)	Sandstone; of a yellow color	4 ft. 0 in.
(4)	*Ore;* sandy, in small loose pieces.	
(3)	Sandstone, Debris; about	30 ft. 0 in.
(2)	*Ore;* the *big sandy seam*	8 ft. 0 in.
(1)	Debris; to bottom of steep slope	80 ft. 0 in.

The lower part of the *big sandy seam*, (2), is a coarse grain, friable, granular, sandy, ferruginous rock, that is but little calcareous on the outcrop, though it is most probably a sandy or siliceous limestone below the point of weathering, The more sandy portions of it are in interstratified streaks of layers which stick out or are prominent on the weathered outcrops.

Along the road down the north-west side of the ridge near the center of S. 21, T. 9, R. 7 E., there is the following outcropping:

Outcropping near the Center of S. 21, T. 9, R. 7 E.

(9)	Sandstones; flagstones, hard and compact, of light gray and yellowish colors	25 ft. 0 in.

(8)	Debris; about	275 ft. 0 in.
(7)	*Ore;* soft, believed to be from 1 ft. 3 in. to 1 ft. 6 in.	
(6)	Debris; believed to hide an *ore seam* near its top, about	100 ft 0 in.
(5)	Sandstone; very ferruginous, bluff	5 ft. 0 in.
(4)	*Ore;* sandy and calcareous	3 ft. 0 in.
(3)	Debris	30 ft. 0 in.
(2)	*Ore;* limy, poor, forms a bluff, visible	8 to 10ft. 0 in.
(1)	Debris; about	50 ft. 0 in.

The yellowish flagstones of (9) are from 1 to 4 feet in thickness; when first quarried they are soft enough to be easily cut into any required shapes by means of old axes and saws; they are called by the the country people *yellow-stones* and are used extensively in the neighborhood for building chimneys. The dip here is 25 to 30 deg. to the south-east, though a little farther to the south-west this same *yellow-stone*, in an outcrop down in the ravine on the south-east side of the ridge, has a dip of only about 15 deg. to the south-east. On the north-west side of the ridge (East Red Mountain) at some old diggings in the S. W. ¼ and the N. W. ¼ of N. W. ¼ of S. 28, T. 9, R. 7 E., there is the following outcropping:

Outcropping in the W. ½ of N. W. ¼ of S. 28, T. 9, R. 7 E.

(11)	Shales, sandstones; the sandstones occur as seams of flagstones in the shales	40 to 50 ft. 0 in.
(10)	*Ore;* good and *soft*, visible	2 ft 6 in.
(9)	Shales, Sandstones, Debris; about	85 ft. 0 in.
(8)	*Ore;* a ferruginous siliceous limestone, very fossiliferous	4 ft. 0 in.
(7)	*Ore;* a ferruginous friable colitic calcareous sandstone, a mass of loosly coherent grains of ferruginous sand	10 ft. 0 in.
(6)	*Ore;* a ferruginous limestone	8ft. 0 in.
(5)	Limestone; siliceous, friable and oolitic, a little ferruginous near the top	3 ft. 0 in.
(4)	*Ore;* limy	2 in.
(3)	Sandstone; of a brownish color	1 ft. 0 in.
(2)	Limestone; roughly weathered, very fossilifer-	

ridge. The north-west [illegible]
ly the crest or tallest [illegible] ....3 ft. 0 in.
the strata of the Red [illegible]
tion to the south- [illegible] the cap or covering rock of
and is covered on i [illegible] The upper strata of
ferous chert. On [illegible] sides of the ridge (East Red
in the S. E.¼ of N [illegible] dug into on its outcrops
the following out [illegible] is very fossiliferous, though
[illegible] extent been obliterated in the

Outcropping in [illegible] and often show only as straw

(11) Sh [illegible] part of this seam of ore is
(10) [illegible] The dip is about 30 deg. to the
(9) De [illegible] in strata high up above
(8) [illegible] section, in outcrops down on the
(7) [illegible] have been quarried to a con-
(6) [illegible] where the Red Mountain (Clin-
(5) [illegible] form the crest of the ridge
(4) [illegible]
(3) [illegible] are also the surface rocks in
(2) [illegible] south-east side of the ridge for some
(1) [illegible] of the ridge. The uppermost of

The [illegible] Clinton] strata dip about 20 deg.
grain [illegible]
but l [illegible] the north-west side of the ridge
prol [illegible] the N. W. corner of S. 32, T. 9,
wea [illegible] something like the following outcrop-
str [illegible] *N. W. Corner of S. 32, T. 9, R. 7 E.*
ne [illegible]

[illegible] Sandstone; about ....225 ft. 0 in.
[illegible] ferruginous limestone with prominent
[illegible] seams or layers on the weathered out-
[illegible] at the bottom, very fossilifer-
[illegible] .... 4 ft. 0 in.
[illegible] ferruginous limestone, sandy on the out-
[illegible] bedded .... 12 ft. 0 in.
[illegible] ferruginous siliceous limestone that
[illegible] weathered outcrops is sandy in places to a
[illegible] inches ...... 14 ft. 0 in.

(3)	Limestone; compact, of a grayish blue color	15 ft. 0 in.
(2)	Debris	10 ft. 0 in.
(1)	*Pelham (Trenton) Limestones*	10 ft. 0 in.

At the above outcropping the seam of red ore that is worked at Attalla crops out on the south-east side of the ridge, (East Red Mountain), it being over (7) of the last section. Along the road as it decends the north-west side of the ridge at Hill's Gap in the S. E. corner of N. E. ¼ of S. 6, T. 10, R. 7 E., the outcrop is about as follows:

Outcropping in the S. E. Corner of N. E. ¼ of S. 6, T. 10, R. 7 E.

(8)	Debris, Sandstones; the sandstones are in flags, about	50 ft. 0 in.
(7)	*Ore; soft* and good	1 ft. 6 in.
(6)	Debris. Shales, Sandstones; the sandstones occur as flaggy seams	200 ft. 0 in.
(5)	*Ore;* good, *soft*	10 in.
(4)	Shales, Debris, Sandstones; the sandstones are flaggy, about	150 ft. 0 in.
(3)	*Ore;* a ferruginous siliceous limestone	8 ft. 0 in.
(2)	Debris	15 ft. 0 in.
(1)	*Pelham, (Trenton) Limestones.*	

The *soft* ore (7) is said to be *hard* (limy) ore just to the north-east of this gap. This same seam of ore crops out some 70 feet below the top of the ridge in an old road down the north-west side of the ridge some ¾ miles farther to the south-west. There is also here in an old field on the north-west side of the ridge, the outcrops of several streaks of good *soft* ore and a streak of hard compact ore that resembles limonite.

(3) *Devonian.* (d) *Black Shale.* This formation forms a line of outcrops on each side of Wills Valley. The one on the north-west side of the valley is not continous clear through the county, because in the south-

western part of the county its strata are in places completely engulfed in a big fault and in other places are partly engulfed in this fault. These outcrops on both sides of the valley occur usually along the tops and near the tops, on the steep sides, of the Red Mountain (Clinton) and Sub-carboniferous Chert ridges. These outcrops, however, from the crumbling of their strata on exposure, are most often seen in the gaps through the ridges. The strata of this formation consist of a bituminous black shale with some argillaceous bluish and greeninsh shales, and some carbonaceous and bituminous flaggy sandstones that are usually ferruginous. They vary in thickness from about 10 feet to about 200 feet, with an average thickness of not over 20 feet. They carry much iron pyrites and hence many deep shafts have been sunk into them by the mineral hunters in quest of gold,silver, copper, etc, with what success may readily be imagined. These shafts, however, have been sunk at the expense of great time and money, as the unweathered strata are very hard and very difficult to blast, though they soon crumble or fall to pieces on exposure from the presence of the pyrites. The visible outcrops are especially numerous in this county, though it will not be necessary to mention more than a few of them.

(A) *Outcrops on the North-west Side of Wills Valley.* In the Winston Gap road, near the center of the N. E. ¼ of S. E. ¼ of S. 36. T. 7, R. 7, E., there is the following outcropping:

Outcropping near the Center of N. E. ¼ of S. E. ¼ of S. 36, T. 7, R 7 E

(7) *Fossiliferous Chert;* in ledges.

(6)	Shale; stained reddish or ferruginous	4 ft. 0 in.
(5)	Shale; of a green color	4 ft. 0 in.
(4)	Shale; hard though badly broken up, of a greenish color, about	8 ft. 0 in.
(3)	*Black Shale*; the upper part slightly brownish, with streaks of limonite from the weathering or oxidation of pyrites, visible	4 ft. 0 in.
(2)	Debris	4 ft. 0 in.
(1)	*Black Shale;* with a slight brownish tinge, visible	4 to 5 ft. 0 in.

Outcropping in N. W. ¼ of S. W. ¼ of S. 10, T. 7, R. 8, E.

(5)	*Lauderdale (Keokuk) Chert;* in ledges.	
(4)	Shale; bluish and argillaceous	17 ft.
(3)	*Black Shale*	17 ft. 8 in.
(2)	Debris	10 ft. 0 in.
(1)	*Red Mountain (Clinton) Sandstones.*	

From an outcropping of Black Shale in the N. W. ¼ of S. 9. T. 6, R. 9, E., copper and silver are reported to have been taken, but, of course, this is not true. There is however just under it here a thin flagstone that is of very good whetstone grit, then a white clay about 2 feet thick to an underlying blue shale. The visible bedded strata of Black Shale and Fossiliferous Chert are here about 20 feet apart. Some 4 feet over an outcropping of Black Shale about 25 feet thick in the S. E ¼ of N. E. ¼ of S. 13, T. 5, R. 9, E., there is a sandstone of about the same color as the Black Shale. A little farther to the north-east, just across a gap in the ridge, there is the following outcropping:

Outcropping in the S. E. ¼ of N. E. ¼ of S. 13, T. 5, R. 9 E.

(10)	*Fossiliferous Chert;* in ledges	
(9)	Debris	4 to 5 ft.
(8)	*Black Shale*	25 to 30 ft.
(7)	Shale, Sandstone; the shale is of a bluish color and has the sandstone	

western part of the county its
pletely engulfed in a big fault
partly engulfed in this fault.
sides of the valley occur usua
the tops, on the steep sides,
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crops, however, from the
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[illegible]

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In Winston C.
of S. E. ¼ of S. 36.
ing outcropping:

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9 ft.
60 ft.
90 ft.
20 to 25 ft
4 ft.

is 75 deg. to 80 deg.
ast side of the Fos-
E. ¼ of N. E. ¼ of S. 6.
wing outcrop:

of S. 6, T. 5, R. 10 E.

.... 4 ft.
.... 18 to 20 ft.
of yellowish
.... .. 20 ft.
.... 50 ft
the sandstone
and ferruginous
2 inches each in
... . 10 ft
.... 6 ft
of an iron rust
.... 4 ft
. ... 5 to 6 ft.
lor with a green-
. ... 5 to 6 ft
of an iron rust
. ... 25 to 30 ft

] *Sandstone.*

Head Cove. This formation in
ds as far to the south-west as the
S. 15, T. 3, R. 10 E. Its most
to a thickness of from 15 to 20

nter of N. W. ¼ of S. 15, T. 3, ntervals on the side of a hill for ough an altitude of some 50 feet. vever, is either in waves or is of a me 30 deg. towards the south-east be to the north-west. It has in its atified thin ledges of dark brown ms of ferruginous sandstones and gillaceous shale.

near the Center of S. 10, T. 3, R. 10 E.

ert; in ledges.	
le; sandstone of with some little bluish gray	1 ft. 6 in.
uish gray color, about	12 ft 0 in.
....	12 to 15 ft. 0 in.
laceous and of a bluish color, visible.	4 to 5 ft. 0 in.

ere is about 30 deg. to the north-west.

ops on the south-east side of Wills Valley.

outcrops on this side of the valley are not as numerous as they are on the north-west the reason that East Red Mountain or the and Sub-carboniferous Chert ridge on the st side of the valley is much higher and has not y gaps cut through it.

Outcropping on the A. G. S. R. R. near the State line.

iliferous Chert.	
hale; of a bluish color, with reddish brown streaks	3 ft 0 in.
A hard compact slate colored rock with iron rust over the surface	1 ft. 6 in.
Black Shale......	15 to 16 ft. 0 in.
Shale; of a bluish color........................	0 to 8 in.
Black Shale..................................	1 ft. 6 in.
Shale, Sandstone; the shale is bluish and has	

in it the sandstone in streaks of about 2 inches each in thickness with an iron rust over its weathered surfaces; there may be also some streads of *black shale* in the upper part of this blue shale; visible	80 to 100 ft.

The dip of this outcrop is 70 deg. to 80 deg. to the south-east.

In the gap through the Fossiliferous Chert ridge at the Fort Payne mill, in the N. W. ¼ of N. W. ¼ of S. 18, T. 7, R. 9 E., there is the following outcrop:

Outcrop in the N. W. ¼ N. W. ¼ of S. 18, T. 7, R. 9 E.

(5) *Fossiliferous Chert;* in ledges.	
(4) A Siliceous or Sandy Looking Rock; fine grained and of a dark color, with nodules of chert and geodes of quartz that are oolitic on the inside, believed to be Sub-carboniferous	15 ft.
(3) Shale; of a greenish color, from	3 to 4 ft.
(2) *Black Shale;* visible	12 ft.
(1) Debris.	

The dip here is about 25 deg- to the south-east.

(4) *Lower Sub-carboniferous,* (e) *Fort Payne Chert,* (*Tuscumbia Limestones and Lauderdale Chert.*)—This formation, from 200 to 300 feet thick, forms a belt on each side of Wills Valley. These belts cover the sloping sides of West and East Red Mountains. Their combind area is about 35 square miles. This formation is made up of chert and limestone with some shales and clay and some little limonite. The chert, for the most part, is in stratified seams in the lower part of the formation, though some of it, principally as interbedded nodules, occur in the upper strata. The flinty cherty ledges of almost pure hornstone in the lower part of the formation show in places outcrops some 75 feet thick. The limestones occur principally at the top of the formation. They are usually gray and cherty, though they are sometimes pure enough to burn into very good lime.

The shales are usually argillaceous and of a greenish blue color. They occur principally at the bottom of the formation, though they are very variable as to their occurrence and are often wanting. The clays, from the weathering of argillaceous cherty seams, occur principally in the lower part of the formation. They are very variable or local in their occurrence They, however, give to the formation in this county its principal economic value. The limonite is also principally in the lower part of the formation. It has been seen in only a few places and not in very large quantities in these places.

The strata of this formation have an average thickness in the county of about 250 feet. They might be divided into the two Sub-formations, *Tuscumbia* (*St. Louis*) *Limestones* and *Lauderdale* (*Keokuk*) *Chert*, from the fact that the strata of the former of these Sub-formations are valley making while those of the latter are ridge making. They could however be separated only approximately by these topographical features, as the two sub-formations gradually blend into each other, and hence, as the former or upper one in this county is quite thin and as its strata, as a general thing, are so cherty as to closely resemble those of the underlying one, no attempt at a division into the two sub-formations will be made, but they will be considered together, as *Fort Payne Chert*.

(A) *Outcrops of the belt on the north-west side of Wills Valley*.—This belt is not continuous through the county, because in the south-western part of the county its strata are in places engulfed in a fault. Its strata, except in the north-east part of the county, are steep, being in many places on the outcrops more than vertical or bent over towards the north-west until they have a south-east dip. It is cut through by many branches and hence it shows in many places outcrops of its bedded strata, especially those of its cherty strata. These cherty strata, at or near the bottom of the formation, frequently crop out as hard ledges along the tops of the ridges, forming a kind of back-bone to the ridges. They also show in places as loose boulders, frequently ferruginous, along the tops of the ridges. The surface around these loose boulders is most frequently covered with loose angular chips of chert. The boulders are sometimes of these chips held together by iron oxide. The limestone outcrops are for the most part in the southeast edge of Sand Valley, a narrow valley between this ridge (West Red Mountain) and Raccoon Mountain. These limestones, principally of a light gray color, often have in them large horn-shape concretions of chert. The upper ones however are frequently quite pure. They in several places show a thickness of about 50 feet.

Limonite in considerable quantity is scattered over the surface along with loose boulders and nodules of ferruginous chert in N. E. ¼ of N. E. ¼ of S. 6, T. 9, R. 6 E. This ferruginous chert, in large loose boulders, also shows over the top of the ridge (West Red Mountain) in the S. E. ¼ of N. E. ¼ of S. 13, T. 9, R. 6 E. The surface around them here is covered with the small angular chips of chert, and some of the boulders are simply of these angular chips held together by iron oxide. The upper limestones of a knob on the ridge in the southwest corner of S. 5, T. 9, R. 7 E., have in them the large horn-shape chert concretions while the lower ones have irregular cherty nodules. In outcrops of these limestones on the northwest side of the ridge in T. 9, R. 7. E., W. ½ of S. 5, and N. E. ¼ of S. E. ¼ of S. 6, there are several caves. One of these caves was opened up in search of a supposed hidden treasure of silver. It is of two large rooms with many beautiful stalactites and stalagmites. The ridge over these caves is covered with the loose angular chips of chert.

Just under an outcropping of cherty ledges in the N. E. ¼ of S. E. ¼ of S. 6, T. 7, R. 7 E., there is a soapstone looking rock of very light weight that is free of grit and is of a brownish red color. It is doubtless nothing more than the very thoroughly leached outcrop of a slightly ferruginous cherty seam. The limestone outcrops in T. 7, R. 8 E., S. E. ¼ of N. E. ¼ of S. 17 and S. E. ¼ of S. W. ¼ of S. 9, are of a coarse grain crinoidal rock of blue and gray colors with calcite streaks and with, in its upper part, the large horn shape concretions of chert. The cherty strata on each side of a gap through the ridge, just wide enough for a wagon road, in the S. W. ¼ of S. W. ¼ of S. 3, T. 7, R. 8 E., tower up to a height of some 50 feet. These cherty walls have a thickness of some 75 feet and are bent over towards the north-west until they have a dip of from 80 deg. to 85 deg. towards the south-east. The limestones with the large horn shape concretions crop out around a big spring in Sand Valley in the north-west corner of S. 9, T. 6, R. 9 E., and the cherty strata near the bottom of the formation form a ledge or back-bone along the top of the ridge in the north-west corner of S 3, T. 6, R. 9 E. At this last named locality, on the top of the ridge, there is a clay test pit with the following outcropping:

Section in a Test pit in the N. W. Corner of S. 3, T. 6, R. 9 E.

(6) *Chert;* ledge, weathered into a sandy ledge of a yellow color and very light weight.......... 8 to 12 in.
(5) Debris.................................2 to 3 ft. 0 in.
(4) *Clay;* a white potter's clay without grit, in places a

	beautiful white *halloysite*	3 ft. in.
(3)	*Clay;* of a bluish color, about	3 ft. 0 in
(2)	*Debris*	25 to 30 ft. 0 in.
(1)	*Black Shale; Devonian.*	

This white potter's clay, derived from the weathering of argillaceous cherty seams, shows in many places hereabouts along the top of the fossil chert ridge. It, in some of its outcrops, is called *chalk*. In this neighborhood, there are lime sinks along the north-west foot of the fossil chert ridge [West Red Mountains.] They doubtless occur in the outcrops of the light gray limestone.

A white mud or plastic clay forms some low flat lands in the south-east edge of Sand Valley in the N. E. ¼ of N. E. ¼ of S. 13, T. 5, R 9 E. This mud or clay is said to be fine for making chimneys. Its chimneys are said to get harder and better with age and use. It comes from the weathering of argillaceous strata. The white potter's clay of this formation is said to have been dug into on top of a high point of the ridge in the S. W. ¼ of N. E. ¼ of S. 16, T. 4, R. 10 E.

The Alabama White Sulphur Springs, in the south-west corner of S. 10, T. 4, R. 10 E., are in a gap of this ridge. They are in outcrops of ledges of chert and cherty limestones of this formation, though they doubtless have their origin in the underlying Black Shale [Devonian.] They consist of a group of five springs within a radius of about 30 yards. The waters of three of these springs are more or less impregnated with sulphuretted hydrogen gas, though none of them very strongly so. The waters of all of them are cool and palatable.

The main sulphur spring has a light grayish deposit which is sometimes of a pinkish color. The waters of the other two sulphur springs are so soft as to be almost freestone water. The strata at these springs dip about 20 deg. to the north-west, though the cherty limestones some 75 yards to the north-west of the springs have a dip of only 10 to 15 deg. to the north-west. In these cherty limestones there is a cherty seam that has in it bright colored specks of iron pyrites which have been supposed by the country people and some of the visitors to the springs to be a precious metal of some kind.

(B) *Details of Deer Head Cove.* "*Pudding-ridge*," a broad broken ridge of the central part of Deer Head Cove, is mostly of the rocks of this formation. The limestones with large horn-shaped concretions of chert are to be seen at the head of this cove. Lime sinks occur along the south-east edge of the "*Pudding Ridge*," and some of the cherty seams of this broken country are ferruginous. The bottom strata of the formation, those just over the Black Shale, in the S. W. ¼ of N. E. ¼ of S. 10, T. 3, R. 10 E., are of a hard cherty bluish gray limestone with streaks, on the weathered outcrops, of a dirty yellowish color.

(c) *Details of the belt on south-east side of Wills Valley.* In a general way, this belt is broader than the one on the north-west side of the valley because its strata have a less dip. Its ridge [East Red Mountain] however dwindles down to a succession of knolls some ¼ mile before it gets to the Georgia line. In this ridge opposite Eureka or in the N. E. ¼ of N. E. ¼ of S. 34, T. 4, R. 10 E and along the ridge for some two miles to the south-west, there has been exposed and worked to a considerable extent the potter's and fire brick clays of this formation. These clays in places show a combined thickness of about 40 feet and have been worked to a thickness of about 30 feet. They have been derived from the weathering of the hard argillaceous ledges at or near the bottom of the formation. They are much better developed in places along their line of outcrops than in others or in other words they occur more or less in pockets. In places, however, they are said to be from 180 to 200 feet thick, and that about 60 feet of this thicknes is a white clay that is suitable for fine pottery. They have been shipped to pottery works at Trenton, New Jersey, and Chattanooga, Tenn., and to the fire brick works in the latter city. Certain strata in this clay are said to carry from 36 to 62 per cent. of alumina. The Franklin [Ohio] Pottery Company Mines, opposite to Eureka or in the N.E ¼ of N.E.¼ of S 34,T.4,R.10 E.consists of extensive surface working and of drifts and slopes on the outcrops of the clay along the top of the ridge and of tunnels or drifts down on the south-east side of the ridge that have been extended on a level to the clay which they strike far below the outcrop. Along the wagon road over the ridge through the surface diggings, there is about the following section:

Section of Surface Diggings in the N. E. ¼ of N. E. ¼ of S. 34, T. 4, R. 10, E

(9)	Debris.	
(8)	*Chert;* of a flinty nature, in ledges of from 4 to 18 inches each in thickness, between the ledges are stratified layers of a fine grained sharp gritty powder of white and yellow colors, about	12 ft. 0 in.
(7)	*Chert, Clay;* the chert is a hard siliceous rock that has a very harsh or gritty feeling, it is of a light yellow color and has in it thin seams of a hard yellow rock with seams and concretions of flint and with thin streaks of clay, about	12 ft. 0 in.
(6)	*Clay;* mostly of a light yellow color with seams of white potter's clay and streaks of clay that are somewhat of a	

	deeper yellow than the main body of clay, about	10 ft. 0 in.
(5)	*Clay, Chert;* in alternate seams, the chert seams are from 2 to 8 inches each in thickness and the clay seams are of about 18 inches each in thickness	4 ft. 0 in.
(4)	*Clay, Chert*; in alternate seams; the chert, about half decomposed, is in seams from 2 to 6 inches each in thickness and is in places stained a slight yellow; the clay is a white potter's clay and is in seams from 6 to 12 inches each in thickness; both the clay and chert seams are however of very irregular thickness, about	18 ft. 0 in.
(3)	*Clay*; very gritty, a decomposed white gritty rock of a chalky appearance, about	10 ft. 0 in.
(2)	*Debris*; *clay* and shale, the clay is white and gritty, the shale is greenish, about	10 ft. 0 in.
(1)	*Black Shale*; *Devonian*.	

In other outcrops, the Black Shale, (1) of the above section, is seen within 2 to 3 feet of the workable clay. In these mines of the Franklin Pottery Company, the upper half or 20 feet of the clay is, as a general thing, more siliceous or gritty than is the lower half (20 feet) and hence it is not so plastic and not so well suited for potter's work. It is therefore a *fire brick clay*, while the upper or more plastic half is called a *potter's clay*. The potter's clay of these mines is said to be worth from $20.00 to $40.00 per ton at Trenton, New Jersey, the hard pure halloysite, used for glazing purposes, being the most valuable. The irregular seams and streaks of chert, usually of a grey color, that run through the clay is said to be worth about $10.00 per ton at Trenton. It is also used for glazing purposes. In Sept. 1887 but little of the very gritty or siliceous clays or fire brick clays had been shipped from these mines, because there was no convenient market for it. The dip of the upper strata of the above section is about 25 deg. to the south-east, while that of the lower strata is about 30 deg. to the south-east.

To the south-west of the Franklin Pottery Company Mines, there runs along the top of the fossil chert ridge (East Red Mountain), forming a back bone to the ridge, ledges of rough massive boulders of flinty chert. In the chert just over the clay deposits, there is in places considerable limonite. This ore occurs in regular stratified seams. There are some loose nodules of it scattered over the surface that have come from the weathering of the seams on the outcrop. Some of this ore is of good qualtity, though the most of it is too siliceous to be of any value. Hard rotten or well leached fossil chert strata occupy or take the place of the clày deposits in an outcrop in the S. W. ¼ of N. W. ¼ of S. 3, T. 5, R. 10 E. In an outcrop on top of the fossil chert ridge in the S. E. ¼ of N. E. ¼ of S. 4, T. 5, R. 10 E., the clay that has been mined is some 10 feet over the Black Shale.

The *Montague Clay Mines*, in the N. E. ¼ of S. E. ¼ of S. 4, T. 5, R. 10, E., are worked through a tunnel down on the south-east side of the fossil chert ridge [East Red Mountain]. The clay of this deposit or pocket, or of these mines, is quite uniform for about ½ mile in a north-east and south-west direction; it then, at both ends, begins to gradually change into flinty cherty seams. It however in these mines, is much more uniform and has fewer streaks and stains of iron oxide in it than that of any other like deposit that has been seen in this formation, though it is not so plastic or is not so well suited for pottery purposes as that of many other known deposits of this formation. It has however been better developed or exposed than any other of these deposits. In these mines, the clay is about 30 feet thick. Some of this clay is of a dark brown color. This coloration however is due to vegetable matter and hence, can be easily burnt out. There is therefore no objecttion to it. In this clay deposit there are some few thin seams of flinty chert that are full of crinoidal stems. The clay of these mines is shipped to Chattanooga, Tenn., where it is used for the most part, so said, for making fire bricks. The cap or covering rock to the clay of these mines is a hard flinty chert that is in ledges of about 18 inches each in thickness. The dip of this cap rock is about 30 deg. to the south-east. Just under this clay, between it and the Black Shale, there is said to be a rock of a dirty yellow color from 6 to 10 feet thick.

Much of the fossil chert on the north west side of the ridge (East Red Mountain) in the N. E. ¼ of N. E. ¼ of S. 1, T. 6, R. 8, E., has in it cavities that are lined with beautiful crystals of quartz which in the sunlight shine like real brilliants. On top of the fossil chert ridge about in the S. W. ¼ of N. W. ¼ of S. 12, T. 6, R. 9, E., there is an old drift in an outcropping of clay about 4 feet thick. This clay is however of irregular thickness, being in places almost squeezed out by bulges in the cover. It has in it balls of concretions of halloysite that are usually hollow with a white incrustation on the inside of the shell. It has in it also red streaks and spots of iron oxide and also lumps and streaks of limonite. This limonite also occurs in several thin irregular streaks or seams in the rocks for 5 to 6 feet over the clay. It is in an orange colored clayey matrix and is siliceous. The *Black Shale* is less than 3 feet under the floor of this old drift. The dip here is about 20 deg. to the south-east.

The flinty chert of this formation, in ledges, form a bluff 25 to 30 feet high in an outcrop in a gap through the ridge in the N. E. ¼ of S. W. ¼ of S. 14, T. 6, R. 9, E. At the foot of this bluff, there is a big spring. In a bed or pocket of clay about 30 feet thick, on the top of the fossil chert ridge and on the south-east side of this ridge near its top, in the N. W. ¼ of S. E. ¼ of S. 15, T. ,9 R. 9. E., there are numerous surface diggings and several tunnels or drifts. The clay of this deposit in places is of a most beautiful quality and is especially well suited for the manufacture of the finest of pottery; in other places it is too badly stained with iron oxide streaks to be of use for such purposes; and in still other places it is of a mediocre quality or is more silliceous, being more suitable for the making of more common pottery and fire bricks. A set of china of over 700 pieces, said to have been made from this clay, took the premium at the New Orleans Cotton Exposition. This clay deposit has a serious defect in that its iron stains and streaks are very irregular and are liable to come in at any time. This clay has in it also some dark stains but they are not objectionable as they can be readily burnt out. It has in it in places seams and nodules of halloysite and common fossfliferous chert. The halloysite is beautiful. Its nodules or concretions are most commonly hollow with a white powder incrustation on the inside of the shell. The chert has in it crinoidal stems that are badly weathered like the matrix rock. The cover to this deposit of clay is of hard cherty flagstones, of about 13 inches each in thickness. In several places, the *Black Shale* was seen only 2 to 3 feet under the clay. The strata here show themselves to be in waves with a north-east and south-west trend. Their general dip is from 20 to 30 deg. to the south-east.

Just under the outcropping of hard cherty ledges in the gap through the ridge at the Fort Payne Mill about one mile to the south-west of Fort Payne, there is a fine grain sandy looking hard rock of a dark color with imbedded nodules of flinty chert and concretionary geodes of quartz that are oolitic on the inside surfaces. This hard sandy looking rock is in ledges of about 18 inches each in thickness that are separated from each other by layers of a softer though similar material about 2 inches each in thickness. The whole is about 15 feet thick. Just under it, between it and the *Black Shale*, there is 3 to 4 feet of a greenish shale. Just south-west of this gap and on the south-east side of the ridge, there is a large deposit of limonite, though it is mostly cherty.

This formation from opposite Collinsville on to the south-west to the county line is confined to the south-east side of the ridge [East Red Mountain], the crest and the north-west side of the ridge being of the undelying Red Mountain (Clinton) strata. Its outcrops highest up on the side of the ridge, or the outcrops of its lowest cherty strata, frequently form a lower ridge or line of knolls on the side of the main ridge [East Red Mountain] with a shallow depression between them and the top of the main ridge.

(5) *Upper Sub-carboniferous*, (f) *Bangor Limestones and Hartselle Sandstones*, (contemporaneous with Oxmoor Shales and Sandstones.] This formation forms a belt on each side of Wills Valley with a combined area of about 25 square miles. The north-west belt includes a part of the side of Raccoon Mountain and also a part of the narrow valley (Sand Valley) along its foot, and the south-east belt a part of the side of Lookout Mountain and also a part of Little Wills Valley. The forma-

tion is made up of limestones with some shales and sandstones. It is from 500 to 800 feet thick. The limestones, of blue and gray colors, are highly fossiliferous with small *crinoidal stems, corals, etc.* The shales are calcareous and occur principally at the top of the formation. They, and especially the sandstones, are very variable and local in their occurrence. The sandstones correspond to the massive sandstones at the top of Hartselle Sandstone Sub-formation of the Tennessee Valley Region. They occur here at the bottom of the formation. They are comparatively thin and have been seen in only a few places.

The north-west belt. This belt, except up near the Georgia line, is narrower than the south-east belt, because its strata are steeper. In the south-west part of the county, it is also narrow because its strata are either wholly or partly engulfed in a fault. Where not engulfed in the fault, they are so badly covered up as to show in only a few places to the south-west of the Nicholson Gap. Farther to the north-east, however, their visible bedded outcrops are numerous. They can be seen in the north-east part of the county to extend over ⅓ of the way up the side of Raccoon Mountain. The sandstones, near the bottom of the formation, form an occasional low short ridge or line of low knolls along near the central part of Sand Valley. There are also along the central part of this valley many fine springs.

Deer Head Cove shows around its head and on each side of it a thickness of about 400 feet of the limestones of this formation.

The south-east belt. This belt shows for its whole length bedded outcrops of its strata. The calcareous shales occur high up on the side of Lookout Mountain, the sandstones in an occasional knoll or low short ridge along the foot of the mountain, and the limestones between the shales and sandstones. There are however some interstratified shales in the limestones and in places there may be a few strata of limestones under the sandstones. The limestones outcrops are in many places covered with a growth of red cedar. In the limestones on the side of the mountain about one mile south-west of Fort Payne is the *Manitou Cave*. This cave is an uneven high broad long archway, higher and broader in places than in others. Its clear space is from 10 to 50 feet in height and from 12 to 50 feet in breadth. It can be traversed for over a mile in a general south-east direction. Its floor is cavernous, as is evident from the sound in walking over it. It is made very uneven by piles of earth that were worked extensively for salt-peter during the late war between the States. In these piles of earth, there are impressions of the pick that are just as plain now as when they were made some 35 years ago. The stalactites and stalagmites are comparitively few in the cave, though there are some very beautiful ones that have received such fanciful names, as ; *the throne*, *the rose*, *the lion and lamb*, *the altar*, etc. There is throughout the greater length of the cave a running stream that comes to light as a big spring at the foot of the mountain, some 40 feet below the mouth of the cave.

Limonite in considerable qnantity and of very good quality has been seen in several places lying loose over the uppermost strata of this formation. This ore comes, however, from the outcrops of a stratified seam in the bottom strata of the Coal Measures, and is believed to be an altered carbonate.

(6) *Carboniferous*, (g) *Coal Measures*. This formation, from its areal extent alone, is by far the most important formation in the county. It covers nearly 6-7 [600

square miles] of the surface area of the county, or all of the county outside of Wills Valley. Its surface area on Raccoon Mountain is some 440 square miles and on Lookout Mountain about 155 square miles. It is made up principally of the two hard conglomerates and of the hard sandstones near the base of the Coal Measures, though it has in places a good thickness of softer strata, under, between, and over these conglomerates. It, in places, is over 600 feet thick and has in it 8 or more different seams of coal, though as a general thing it is much thinner than this, with the Upper Conglomerate as its principal surface rock. This upper conglomerate forms many naked glady places. The Lower Conglomerate makes great exposures in the high bluffs capping the mountains and often occurring along the water courses. Fig. 5 is of this lower conglomerate on the north-west brow of Lookout Mountain. It shows how even this very hard rock is gradually wasted away on weathering.

The following is an approximate general section of the thicker Coal measures of DeKalb county:

General Section of the Thicker Coal Measures of DeKalb County.

	Sandstones; often shaly and slabby	0 to 75 ft.
(8)	*Coal*	4 in to 2 ft.
	Shales	4 to 10 ft.
(7)	*Coal*	0 to 0 ft. 10 in.
	Shales	25 to 30 ft.
(6)	*Coal*	3 in to 1 ft. 8 in.
	Upper Conglomerate	50 to 60 ft.
(5)	*Coal*	0 to 1 ft.
	Shale	0 to 9 ft.
(4)	*Coal;* corresponding to Sewanee Seam of Tennessee	1 ft. to 3 ft. 6 in.
	Shales, Sandstones	35 to 40 ft.
	Lower Conglomerate	25 to 100 ft.
(3)	*Coal*	0 to 3 ft. 6 in.

	Sandstones, Shales	40 to 50 ft.
(2)	*Coal;* corresponds to Dade or Eureka Seam	1 ft. 6 in. to 2 ft. 8 in.
	Potter's Clay; full of fossil stems and leaves	3 ft. to 20 ft.
(1)	*Coal*	6 in. to 1 ft. 6 in.
	Sandstones, Shales; about	250 ft.
	Upper Sub-carboniferous Formation.	

The coal is variable and is cut up more or less by slate partings, still, for the most part, it is of very good quality. It is of cubical and lamellar structure. The *Dade or Eureka Seam* (2) and the *Sewanee Seam* (4) are the principal coal seams of this county, though the *Cliff Seam* (3) is in many places, on Raccoon Mountain, the most important or thickest seam. None of them, however, are of workable thickness, or are 18 inches and over in thickness, over most of their area in this county, still they are workable over enough area to have a vast amount of workable coal. The Dade or Eureka seam has been worked at the Eureka Old Mines and at the Water Tank, and the Sewanee Seam at the Fort Payne Coal and Iron Company Mines.

Potter's clay of very good quality forms the underbeds to most of the coal seams. It is an argillaceous shale that mines in blocks and is very hard when first mined, though it crumbles on exposure to the air and becomes very plastic when wet. It is of a light ash color and is very fossiliferous with leaf and stem impressions. It has been seen to a maximum thickness of about 15 feet. It has been used in several places for the manufacture of pottery and at Fort Payne also as a matrix for siliceous matter in the making of fire bricks.

Iron ore, in a regular stratified seam, has been seen in several places in the lower strata of this formation. It is a limonite on the weathered or oxidized outcrops, though within it is most probably a carbonate. It is

k and gives rise to the loose
places over the sides of the
nite occurs in places also on
ay iron stones, as nodules im-
in places in this formation,
strata. Flagstones of uniform
ooth and rippled marked sides,
g purposes, etc., are also to be
es in the Coal Measures of this
springs of delightful drinking
erous in this formation, especially
nder the bluff of Lower Conglomer-
ep mountain sides.

res of DeKalb County have already
n detail in the Plateau Report, pub-
which the reader is respectfully re-

CHAPTER VI.

ETOWAH COUNTY.

The geological formations of this county are as follows:

(7)	*Carboniferous*	(h)	*Coal Measures*	200–2000 feet
(6)	*Upper Sub-carboniferous*	(g)	(1) *Bangor or Limestone and Hartselle Sandstone type.*	Contp. 600–1200 ft.
			(2) *Oxmoore Shale and Sandstone type*	
(5)	*Lower Sub-carboniferous.*	(f)	*Fort Payne Chert (Tuscumbia Limestone and Lauderdale Chert)*	150–275 feet
(4)	*Devonian.*	(e)	*Black Shale*	10-75 feet
(3)	*Upper Silurian.*	(d)	*Red Mountain (Clinton) Formation*	300–700 feet
(2)	*Lower Silurian.*	(c)	*Pelham (Trenton) Limestones*	1000–1500 feet
		(b)	*Siliceous (Knox) Dolomite and Chert*	2000–2500 feet
(1)	*Cambrian*	(a)	*Coosa (Flatwood) Shales and Limestones (Connesauga).*	1800 + feet

(1) *Cambrian*, (a) *Coosa (Flatwood) Shales and Limestones.*—This formation in Etowah county must be exposed to a thickness of 1800 feet or more. It makes two large and comparativly level areas of flatwoods that together embrace nearly 200 square miles of the county. One of these great bodies of flatwoods is to the north-west of the Coosa River and to the south-west of Lookout Mountain, the other is principally to the south-east of Lookout Mountain and the Coosa River. They are separated merely by the Coosa River or their strata are connected at Gadsden and for several miles below that city. These connecting strata are just to the north-

west of a fault and are at or near the top of the formation. Still farther to the south-west, these two great bodies of flatwoods are separated by a mountainous belt of overlying formations that come in to the north-west of the fault. The body of flatwoods to the north-west of the Coosa river are bounded on the north-west and north-east by a great fault, with a maximum displacement of some 7000 feet, that brings flatwood (Cambrian) strata in contact with Coal Measures, and the one on the south-east side of the river is bounded on the north-west by a big fault with a maximum displacement of over 5000 feet than brings its strata in contact with Upper Sub-carboniferous rocks. Both of these bodies of flatwoods show numerous outcrops of their bedded strata, shales and limestones, though they, especially the one to the south-east of the river, have over a great deal of their area a superficial covering of sandy loam and rounded flint and chert pebbles of Tertiary or Quaternary Age. Their bedded outcrops are especially numerous and fine along the river and creeks. Their strata are badly crumpled and broken up and often faulted. They are in waves within waves and wrinkles within wrinkles. The folds, wrinkles, and faults in these strata are partly such as are shown in the accompanying sketch, Fig. 6, of the south bank of the Coosa River some 4 miles above Gadsden.

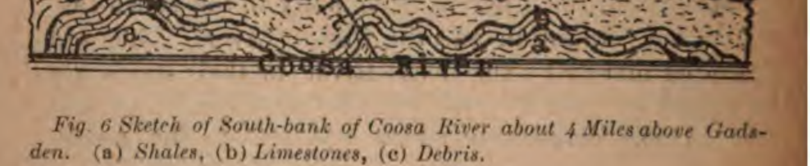

Fig. 6 Sketch of South-bank of Coosa River about 4 Miles above Gadsden. (a) *Shales,* (b) *Limestones,* (c) *Debris.*

The strata have a general north-east and south-west strike, that is often serpentine, or in waves, and usually a steep dip towards the south-east, though the general dip which is to the south-east, is not very great. The shales are for the most part of very dark or of black and brown colors, though on the weathered outcrops they are often yellowish. They are both calcareous and argillaceous. The limestones are mostly thin bedded and of a blue color with streaks of calcite, though some of them are massive. Some of them are banded or are made up of interstratified seams of purer blue limestone and of impure argillaceous limestone that on the weathered outcrops is of a dirty yellowish color. These clayey seams can be seen in many of the outcrops to weather into shales and these shales into a mulatto clayey loam. This mulatto or yellowish clayey loam as a general thing is badly drained and hence is but little in cultivation.

The growth over the flatwoods is mainly of black-jacks, post, and red oaks, short leaf pine, etc., with cedar glades over many of the naked limestone ledges, and with magnificent forests of long leaf pine over the superficial coverings of sandy loams and rounded pebbles of comparatively recent age.

The shales in many places, especially in the banks of the streams, are so black as to have a coaly appearance. They are often knotty or curly and often carry, besides the thin bedded limestones, interstratified layers of flattened lenses and nodules that are sometimes of bituminous or blackened limestone and sometimes of siliceous matter. Some of the massive limestones are quite pure and are hard enough to take a very good polish.

(2) *Lower Silurian.* This group from 3000 to 4000 feet thick in Etowah County forms several irregular

belts with a general north-east and south-west direction. These belts are from a fraction of a mile to over 4 miles in width and together cover about ¼ of the surface area of the county or about 130 square miles. The group is made up of the two formations, (c) *Pelham* [*Trenton*] *Limestones* and [b] *Siliceous* [*Knox*] *Dolomite and Chert.*

[b] *Silliceous* [*Knox*] *Dolomite and Chert*. These rocks from 2000 to 2500 feet thick cover about 100 square miles of the surface area of this county. They form the broken central portions of Murphree's and Wills valleys, a broken belt just to the south-east of Chandler Mountain, an other one just to the north of Colvin Mountain, a narrower one just to the south-east of the Gadsden and Ashville road, and a still narrower one to the north-east of Gadsden.

This formation in Murphree's Valley or in Bristow's Cove, as the nort-east end of that valley or the greater part of it in this county is called, has been treated of in the "Report on Murphree's Valley", published in 1893.

The broken belt of this formation in Wills Valley extends to the south-west down into Greasy Cove, the south-west end of the valley. It comprises the lowest or oldest rocks of the valley and hence it covers the top of the anticlinal fold of the valley. It is so thickly covered with residuel matter, loose chert, etc., as to show but few bedded outcrops, except along the water courses that run across it and along its edges. Along its north-western edge, there is a big fault with a great displacement of strata. Along this fault, there are a good many visible outcrops of massive dolomites that belong in the lower part of the formation. They, as a general thing, have a south-east dip, as do all of the strata of this belt, unless it is of a very narrow strip at the south-west end of the fault or in the south-west end of Greasy Cove with a steep north-west dip. The north-west dip, from the presence of local waves and wrinkles in the strata, also occurs in places away from the fault.

Over the upper strata of this belt in places, there are massive boulders of light and orange colored sandstones and breccia. The sandstones are sometimes a beautiful fine grain white rock. The breccia is a sandstone with sometimes small rounded flint pebbles of the size of bird shot and sometimes angular cherty pebbles. These rocks often become friable on weathering. They come from stratified ledges at least several feet in thickness. The breccia with angular cherty pebbles in places have a cherty matrix, as the outcrop of a ledge from 4 to 5 feet thick on the south side of Clear Creek near its mouth. Over this ledge and at the very top of the formation or it may be at the very bottom of the overlying formation, there are some flaggy sandstones and breccia, as can be seen on the west side of Big Wills Creek just below the mouth of Clear Creek. These flagstones are calcareous and on the weathered surfaces are usually of a light ashy grey color, though sometimes of a dark ashy grey color, and within are of a brownish straw color with blackish specks and splotches. The pebbles of the breccia are of small pieces of flint or flinty chert that stick out prominently from the weathered surfaces of the rocks. They are usually in interstratified layers, from 1 to 2 inches thick, along which the rocks split. Some of them have their edges more or less smooth or rounded.

Along the south-east edge of the belt and so at the top of this formation or at the bottom of the overlying formation, there are many visible outcrops of a massive white dolomite, as over Duck Spring. This is a beautiful spring of clear sparkling lime water. Lower down in the formation, along the north-west edge of the belt or along the fault in the north-east part of the county, there are outcrops of a gray dolomite with interstratified seams or chert.

This formation, badly broken up, forms an isolated broken patch along Big Wills Creek west of Attalla or in the gap between the Attalla Red Mountain on the north-east and the one around the north-east end of Chandler Mountain on the south-west. The greater part of this patch was connected orriginally with the belt just to the south-east of the Chandler Mountain but was cut off from it by a fault and the injection of Cambrian strata. The smaller part of it, the portion to the east of the Coosa and Tennesse R. R., however, belongs to the Attalla mountain and hence more properly to the belt of Wills Valley. That the strata of this patch are badly broken up can be plainly seen in the outcrops along Big Wills Creek. The uppermost of these outcrops or those highest up the creek are of almost pure cherty ledges, while the lower ones, those farthest down the creek, are of massive dolomites and limestones that give rise to a deep red loam. These last named rocks form a high bluff some 200 yards long on the east bank of the creek. They are all so badly broken up as to have no regular strike and to be either vertical or to have a steep dip in many directions.

The belt on the south-east side of Chandler Mountain becomes more and more engulfed in a fault from the county line, Little Canoe Creek, towards the north-east until it is finally completely engulfed in this fault and remains so for some 2 miles to the north-east or to the above insolated patch on Big Wills Creek.

The belt to the south-east of Lookout Mountain or to the north-east of Gadsden is suddenly stopped on the south-west, in the north-east edge of Gadsden, by the transverse fault (Gadsden and Shades Valley Fault) that stops Lookout Mountain on the south-west and curves around by Attalla into the strike fault that runs down to the south-east of the Chandler Mountain. In the south-west end of this belt, in a cut on the Rome and Decatur R. R., there is a showing of white potter's clay. The strata here are badly broken up, showing that they are near the fault. Farther east, about 175 yards north-east of the Old Furnace, Gadsden, there is along the fault a low bluff of the massive dolomites in the lower part of this formation This bluff here runs in a general east and west direction, the direction of the transverse fault Its strata are bent over towards the north until they are in a curve with a dip towards the south, they would. however, in a short distance below the surface doubtless become vertical and then take their regular north-west dip under Lookout Mountain. This bluff in a short distance towards the east stops suddenly or bends sharply to a north-east direction as it butts up against a big strike fault. Its massive rocks follows this strike fault to the north-east until they are cut out at the "*burst up*" about ½ mile north-east of the New Furnace, or in the mouth of the Tidmore Bend, by the fault bending slightly in towards the north-west. These massive rocks form as a bluff the north-west bank of the river for some distance below and above the New Furnace. To the north-east a couple of miles the above strike fault again bends out from Lookout Mountain or towards the south-east until it runs into the Rome and Cahaba Fault or until there comes in to the north-west of it an unsymmetrical anticlinal fold with a very narrow belt of this formation along the fault.

The strata of this narrow belt have a steep dip towards the south-east and are badly broken up and in places partly engulfed in faults. It is much narrower than the belt on the north-west side of the fold, its strata being much steeper. Between these belts, there is a narrow one, the top of the anticlnal, of yellowish shales and thin bedded sandstones under a deep red loam at the bottom of this formation or top of Hayes' Connesauga. The cherty portions of these two belts of this formation are about ½ mile apart at their south-west ends some 5 miles north-east of Gadsden. They gradually approach each other in going towards the north east until they finally come together between Oak Hill P. O and the county line. Between them there are many outcrops of the massive dolomites and limestones in the lower part of the formation that give rise to a deep red loam. In the bottom strata of the south-east belt, there is near its south-west end a showing of light porus soft friable yellowish sandstone or breccia with small angular pieces of hard chert. This rock, freed of its cherty pieces, makes a very good polishing powder, as it is of a sharp fine grain with a harsh feel. A chert breccia occurs also near the north-east end of this south-east belt or in the N. W. ¼ of N. W. ¼ of S. 2, T. 11, R. 7 E.

The Rome and Cahaba Fault crosses the river some 4 miles above Gadsden and again between 2 and 3 miles below that town, and then continues to the south-west just to the south-east of the broken mountainous belt to the south-east of the Gadsden and Ashville road. On the north-west side of the fault about a mile before it first strikes the river, there sets in the point of a wedge-shape ridge of this formation with its butt end forming the north-west bank of the river for about ¼ mile. This wedge-shape ridge occupies a sharp unsymmetrical synclinal with the fault along its steep south-east edge. Its strata, badly broken up, show plainly in bluffs along the river bank. They are dark blue and gray siliceous dolomites and limestones with some imbedded cherty nodules and some interstratified seams of chert. On top of the ridge there are some loose boulders of hard breccia with the angular pieces of chert. The strata along the south-east edge of this ridge show most plainly that they are along the steep south-east edge of a faulted unsymmetrical synclinal. This isolated ridge, therefore, is not, as has been said, the uncovered portion of an area covered up by Cambrian strata pushed over from the south-east, but it is of a sharp unsymmetrical synclinal with a fault along its south-east edge.

The belt of this formation along the north-west edge of the broken mountainous belt to the north-west of the fault after it crosses the river between 2 and 3 miles below Gadsden begins in the river and extends to the south-west to far beyond the county line. It is from ¼ to ¾ of a mile broad.

The belt of this formation just to the north-west of Colvin Mountain extends clear through the county from north-east to south-west. It is from the fraction of a mile to nearly two miles wide. It does not show many bedded outcrops of its strata except along its edges. On its south-east edge near Markton P. O., there is a knoll of coarse grain sandstone that belongs at the top of its strata. Near its north-east end, there are outcrops of a massive white dolomite that belongs at its top or rather at the very bottom of the overlying (c) *Pelham* (*Trenton*) *Limestones*. This rock, in places at least, is impregnated with petroleum. The limonite that occurs in places along the north-west foot of Colvin Mountain must belong at the top of this formation. Maj. G. D. Fitzhugh, in his report on the region along the A. & A. R. R., speaks of this ore, thus:

" At the north-western base of Colvin Mountain and about a half mile from Rock Spring Station is the Robert Jelkes' deposit of brown ore. This deposit is fully 300 feet wide. The ore is in boulders and in the shape of long stalactites, some as long as three feet, well imbedded in orange colored clay. Small lumps and wash ore also occur in the beds. The ore is being mined and screened and hauled in wagons to Rock Spring where it is shipped to Gadsden furnaces. The deposit was traced for more than 3 miles along the face of the mountain, indicating a very large supply of ore. An analysis of this ore shows:

Silica	5.50
Metallic Iron	56.95
Manganese	Trace
Alumina	4.92
Lime	0.30
Sulphur	Trace
Phosphorus	0.13
Water at deg. 212 F	0.50

Analyst, W. B. Phillips.

"About a half-mile north of this deposit is a small ridge containing about 25 acres of ore. Just west of the railroad between Woodward and Rock Spring is an extensive deposit of small lump and wash ore."

To the north-west of this belt about ½ mile with (a) Coosa (Flatwood) Shales between, there is in S's 15, 16, 21, & 22, T. 12, R. 8 E., a high conical-shaped mountain, called *Dry or Young Mountain*, of broken up strata of this formation, that on the south-west may be connected by a ridge with the belt of similar strata to the south-east. It is therefore believed to be just to the north-west of a fault, though it may be in a sharp synclinal or it may have been pushed over from the belt on the south-east and dumped down on the Cambrian strata that now almost if not entirely surrounded it.

(c) *Pelham, (Trenton) Limestones.* This formation from 1000 to 1500 feet thick covers about 30 square miles of the surface area of Etowah county. It forms a long narrow valley along the north-west side and around the north-east end of Murphree's Valley or Bristow's Cove, one on each side of Wills Valley and around the head of Greasy Cove, one just to the south-east of Chandler Mountain, one to the south-east of Lookout Mountain, one to the south-east of Gadsden and Ashville road, and one also just to the north-west of the Colvin Mountain. It forms also a detached belt, several miles long, just to the north-west of the Leeth Mountain some 10 miles north-east of Gadsden. As its strata are valley making or comparatively soft, they do not show in many places in some of the belts or valleys, and for this same reason are more easily sheared off in small faults than the harder strata of the ridges and mountains.

This formation in Murphree's Valley or Bristow's Cove has already been considered in the Murphree's Valley Report, published in 1893.

Its strata on the north-west side of Wills Valley for some 12 to 14 miles down into the county from the north-east are partly and in places are wholly engulfed in a big fault. They are however continuous, with many visible bedded outcrops, on the south-east side of Wills Valley and around the head of Greasy Cove. They also, from their more gentle dip form a broader belt or valley on the south-east side of Wills Valley and Greasy Cove than on the north-west side. This south-east belt or valley is in many places over ½ mile broad, its strata

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prong continuing on towards
Creek until it butts up against
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he last named one is separated
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dge of the [illegible] [*Knox*] *Dolomite*
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east of the Chandler Mountain is
some 2 miles or more to the south-
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north-east to beyond the county line.
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in many places. In the upper of them in several places near the county line there are outcrops of the varigated ferruginous argillaceous limestone, called *calico rock*. This rock weathers sometimes into shales and sometimes into angular gravels and nodules. The ferruginous matter is confined for the most part to the interstratified argillaceous or clayey seams, staining these seams a red color. This rock sometimes has a cherty look and has in it streaks and specks of cherty matter. This *calico rock* is fossiliferous, with *brachiopods* and *graptolites*, and appears to occur at two different geological horizons.

The belt of this formation just to the north-west of the Leeth Mountain shows the above variegated strata for a good part of its length of about 5 miles. This belt is on the opposite or south-east side of a broken and faulted unsymmetrical anticlinal fold from that of the above belt just to the south-east of Lookout Mountain. It occurs just to the north-west of the "Rome and Cahaba Thrust Fault" and is in places either partly or wholy engulfed in that fault, being in these places in contact with (a) *Coosa (Flatwood) Shales and Limestones* on the south-east side of the fault. It shows in its upper strata at the top of this formation some outcrops of yellowish ashy gray limestones with a greenish tinge and with some calcite streaks and some cherty nodules.

The belt to the south-east of the Gadsden and Ashville road is in the line of continuation of the above belt just to the north-west of the Leeth Mountain and was doubtless once connected with it but became separated by the intervening link, some 8 miles long, becoming engulfed in a fault. This belt as it now is, starts in on the north-west side of the Coosa River between 2 and 3 miles below Gadsden and continues to the south-west to far beyond the county line. It too shows outcrops of the variegated ferruginous argillaceous limestone or *calico rock*.

The belt just to the north-west of the Colvin Mountain is continuous clear through the county from north-east to south-west with the exception of a short distance at Davis' Gap where it is engulfed in a fault. It extends high up on the side of the mountain and shows many bluffy outcrops of its bedded strata. The outcrops on the side of the mountain at the "Rock Spring Quarry" at the mouth of the Davis' Gap, shows to a thickness of about 200 feet. The rocks of this quarry are mined extensively and usued for fluxing and for burning into quick-lime. The quarry and one of the lime-kilns are shown in Plate XX. The following analysis of this limestone was furnished by Maj. G. D. Fitzhugh:

Oxide of Iron and Alumina.......	0.30
Carbonate of Lime.	97.00
Carbonate of Magnesia...........	Trace
Silica	1.00
Sulphur.........................	Trace
Phosphorus	Trace

Analyst:—W. B. Phillips.

(3) *Upper Silurian*, (d) *Red Mountain* (*Clinton*) *Formation*.—This formation, from 300 to 700 feet thick, though it does not cover more than 15 square miles of Etowah county is, from an economic standpoint or on account of its red ore, by far the most important formation of the county. It forms a ridge, often a mountain, along the north-west side and around the north-east end of Murphree's Valley or Bristow's Cove; one along just to the south-east of Chandler Mountain that runs around

Valley Regions Report, Plate XX.

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TILDEN FOUNDATIONS

the north-east end and down the north-west side of this mountain, thence along the south-east edge and around the head and up the north-west side of Greasy Cove, and thence up the north-west side of Wills Valley; one down the south-east side of Wills Valley to Attalla; one along just south-east of Lookout Mountain; one just to the south-east of the Gadsden and Ashville road; and one along the south-east boundary of the county. It forms also Leeth Mountain, a short detached ridge about 10 miles north-east of Gadsden, and also a small detached patch on Wills Creek in the gap west of Attalla.

This formation in Bristow's Cove or in that portion of Murphree's Valley which is in Etowah county has been considered in the report on Murphree's Valley. The following additional notes, however, may be of some interest. The following three sections of test pits, near Walnut Grove, are from the field notes of the B. M. R. R:

(1) *Near the Summit of West Red Mountain, 100 Feet West of Preston Turner's House, in the N. E. ¼ of N. E. ¼ S. 22, T. 11, R. 3 E.*

Sandstone; roof.	
Red Ore; inferior	11 in.
Clay	5 in.
Red Ore; inferior	17 in.
Clay floor.	

(2) *On West Red Mountain 400 Feet North of the Guntersville Road, in the N. W. ¼ of S. E. ¼ of S. 14, T. 11, R. 3 E.*

Drift; roof.	
Red Ore; soft and inferior	8 in.
Clay	17 in.
Red Ore; inferior	27 in.
Clay	2 in.
Red Ore; inferior	8 in.
Slate floor.	

(3) *On the South-east Side of West Red Mountain, in the N. E. ¼ of N. E. ¼ of S. 14, T. 11, R. 3 E.*

Slate; arenaceous, roof.	
Red Ore; soft	5 in.
Limestone	2 in.
Red Ore; soft	9 in.
Clay; yellow, floor.	

This formation in the gap passed through by the Turnpike Road north of Aurora P. O., or in the S. E. corner of S. 26, T. 10, R. 4 E., has a dip of from 15 deg. to 20 deg. to the north-west. Near the south-east end of this gap and hence in the lower part of the formation, there is an outcrop of a yellow sandstone about 4 feet thick, and, just under the sandstone, an ore outcrop that is said to be in 5 to 6 seams with shales partings. These ore seams are said to be from a fraction of an inch to 2 feet thick. The thicker of them are reported to have thin shale partings. The thickest ore seam of Red Mountain in this neighborhood is reported to be *hard*, very limy, and about 4 feet thick.

Red Mountain in the bend around the north-east end of Murphree's Valley or Bristow's Cove is high and is steep on both sides. Along its top soon after it makes the bend or in the S. E. ¼ of N. E. ¼ of S. 36, T. 10, R. 4 E., there are some ledges of a siliceous limestone that belongs in the upper part of this formation. They, on the weathered outcrops, are of a dull yellowish gray color and have a dip of 75 to 80 deg. to the south-east. Farther to the south-west, in the S. E. ¼ of S. W. ¼ of S. 36, T. 10, R. 4 E., there is an old test pit with the following section:

Section of Old Test Pit No. 1 in the S. E. ¼ of S. W. ¼ of S. 36, T. 10, R. 4. E.

[7] Shale, Debris.

[6]	*Red Ore; soft* and good	2 to 3 in.
[5]	Shale	2 to 3 in.
[4]	*Red Ore; soft* and good	3 to 4 in.
[3]	Shale	3 in.
[2]	*Red Ore; soft* and good, about	6 in.
[1]	Shale; visible to a depth of	4 to 5 in.

This pit must be near a fault as its strata are badly broken up. Its strata in one place have a dip of about 60 deg. to the ESE. and in an other place, about 8 feet away, their dip is only about 30 deg. to the north-west. To the east of this pit some 75 yards, there is an other old pit with about the following section:

Section of Old Test Pit No. 2 in the S. E. ¼ of S. W. ¼ of S. 36, T. 10, R. 4 E.

(8)	Shale; cover, of a yellow color visible	48 in.
(7)	*Red Ore; soft* and good	18 in.
(6)	Shale	1 to 2 in.
(5)	*Red Ore; soft* and good	2 in.
(4)	Shale	1 to 2 in.
(3)	*Red Ore; soft* and good, about	6 in.
(2)	*Red Ore;* Shales, the ore is shaly	4 in.
(1)	Shales; visible to a depth of	48 in.

The Red Mountain (Clinton) ridge or mountain just to the south-east of the Chandler Mountain that runs around the north-east end and down the north-west side of that mountain, along the south-east edge and around the head and up the north-west side of Greasy Cove and thence up the north-west side of Wills Valley, has a continuation of strata except on the north-west side of Wills Valley where its strata in several places are completely engulfed in a fault. The best outcrops of red ore in this ridge or mountain on the south-east side of the Chandler Mountain are about 2 feet thick. This mountain in making the bend around the north-east end of Chandler Mountain becomes a high broken mountain from 1 to 2 miles broad from north-west to south-east, being here the north-east end of a shallow synclinal trough with a north-east and south-west trend and with its north-east and elevated. Its bottom strata are along a strike fault for some 2 miles before they reach its north-east end and along a transverse fault around this north-east end. These bottom strata are brought in contact with (b) *Coosa (Flatwood) Shales and Limestones* by the strike fault and with (c) *Siliceous (Knox) Dolomite and Chert* by the transverse fault, Near this transverse fault or at the foot of the mountain in the N. E. ¼ of N. W. ¼ of S. 4, T. 12, R. 5 E., there is the following out-cropping:

Outcrop in N. E. ¼ of N. W. ¼ of S. 4, T. 12, R. 5, E.

[5]	Sandstone; shaly, of a yellowish color.	
[4]	*Red Ore*	4 in.
[3]	Shale; of a gray color with a yellowish tinge....	4 in.
[2]	*Red Ore*	16 in.
[1]	Sandstone, hard.	

The strike of this outcrop is about north and south and its dip is about 85 deg. towards the west, though the strata just to the east of it are about vertical.

There are outcrops of red ore in T. 12, R. 4 E., in the S. W. ¼ of S. E. ¼ of S. 12, N. E. ¼ of S. 15, and N. E. ¼ of S. 20. The best of those in S. 12 is about 18 inches thick, of those in S. 15 is from 18 to 20 inches thick, and of those in S. 20 is from 20 to 21 inches thick with a parting, about 6 inches thick, of shale. An out-crop of ore about 2 feet thick, but carrying some shale, shows itself at the county line, in the gap through the ridge made by Little Canoe Creek in the S. E. corner of S. 19, T. 12, R. 4 E. Some 40 yards to the south-east of this outcrop and hence considerable above it, there is a streak of very red loam which looks as if it might cover an ore outcrop. The dip in this gap is from 30 to 35 deg. to the south-east.

The ore outcrops on the opposite or north-west side of Greasy Cove in the N. E. ¼ of S. 8, T. 12, R. 4 E., are from 10 to 12 inches thick. The outcropping in the gap through the ridge near Mr. H. H. Herring's in the N. E. ¼ of S. W. ¼ of S. 4, T. 12, R. 4 E., is about as follows:

Outcropping in the N. E. ¼ of S. W. ¼ of S. 4, T. 12, R. 4 E.

(18)	Shales: cover.	
(17)	*Red Ore;* about	6 in.
(16)	*Red Ore*; Shales, principally ore.	6 in.
(15)	Shale	6 ft 0 in.
(14)	Shale; *Red Ore;* principally shale	10 in.
(13)	*Ore*, Shale; the shale very small	10 to 12 in.
(12)	Shale, *Red Ore;* principally shale	1 ft. 6 in.
(11)	Debris	10 to 12 in
(10)	*Red Ore*	1 ft. 2 in.
(9)	Debris	25 to 30 ft. 0 in.
(8)	*Red Ore;* seemingly about	4 ft. 0 in.
(7)	Shale, Debris; about	45 ft. 0 in.
(6)	*Red Ore;* believed to be from	10 to 12 in.
(5)	Shale; about	35 ft. 0 in.
(4)	*Red Ore;* rotten or well leached, not over	8 to 10 in.
(3)	Shale; about	50 ft. 0 in.
(2)	*Ore*, Shale; principally ore	4 ft. to 5 ft. 0 in.
(1)	Sandstone; flaggy.	

The ore (2) is in wrinkles on the outcrop. A section of it in detail is as follows:

(6)	Debris.	
(5)	*Ore*	5 in.
(4)	Shale	8 to 10 in.
(3)	*Ore;* good	2 in.
(2)	Shale	12 in.
(1)	*Ore;* good	6 in.

The dip of this gap is from 20 deg. to 60 deg. to the north-west.

This formation in places makes almost the entire ridge on the north-west side of Greasy Cove, while in other places the ridge is largely of the overlying rocks. The ore in an outcrop in the N. W. ¼ of N. W. ¼ of S. 3 T. 12. R. 4 E. is reported to be about 7 ft. 6 in. thick and to have only from 4 to 6 inches of shale in it. The strata near it are bent over to the north-west until they have a dip on the outcrop of from 60 deg. to 80 deg. to the south-east. This formation along in the N. E. ¼ of S. E. ¼ of S. 34, T. 13, R. 4 E. is squeezed up into a very narrow sharp ridge that has along its top a backbone of sandstone with a dip of 70 deg. to 80 deg. to the south-east. To the north-east for several miles, the Red Mountain appears to be entirely squeezed out or engulfed in a fault; and for some 20 miles to the north-east, it only appears as knolls and short ridges at intervals, being engulfed in faults in the intervening gaps.

In an old shaft, about 100 yards from the foot of Raccoon Mountain in the S. W. ¼ of S. 17, T. 11, R. 5 E., there is, some 10 feet below the surface, a seam of ore with seemingly about the following section:

Section of Ore Seam in the S. W. ¼ of S. 17, T. 11, R. 5, E.

(4) Shale; cover, yellowish.	
(3) *Ore; soft* and good, about	1 ft.
(2) Shale; yellow, about	2 ft.
(1) *Ore;* seemingly, about	1 ft.

The ore (3) on the outcrop is about 3 ft. thick and is about vertical, though, only 10 feet below the surface in the shaft, it is only about 1 ft. thick and is bent or curved over until it has a dip of about 70 deg. to the south-east. It is very fossiliferous and is of very fine quality. It appears to be engulfed in the fault in about 75 yards to the south-west and within a few steps to the north-east. Along the road but a short distance to the north-east of its outcrop, there is, where the ore ought to be, an outcropping of yellowish shale, without any ore, from 40 to 50 yards broad, with a dip of about 85 deg. to the south-east. To the north-east a short distance, a row of short high ridges set in with a combined length of about a mile. On the top of one of these ridges, in the N. W. corner of the S. W. ¼ of S. 16, T. 11, R. 5 E., there is an outcropping of an ore seam that appears to have in it a few inches of shale between about 15 inches of ore on top and about 18 inches of ore below. This seam is however so mashed and squeezed on the outcrop as to make it almost impossible to tell what it is. The outcrop is bent over to the north-west until it has a dip of about 20 deg. to the south-east. Only a few feet below the surface, the ore is squeezed out to a mere streak and suddenly bends to a dip of 45 deg. to the south-east. In this outcrop, the bottom strata are of course on top. About 100 yards east of here, in a ravine, a shaft has been sunk down to this seam of ore and in it the ore is said to be from 18 inches to 2 feet thick. The dip in the shaft is about 25 deg. to the south-east, the rocks having been pushed over to the north-west to this extent. The ore on the next ridge to the north-east, doubtless of the same seam, appears to be about 3 feet thick and to have some shale in its upper part. Its dip is about 40 deg. to the south-east. On another ridge about 200 yards long a little farther to the north-east or in the S. E. corner of S. 9, and the S. W. corner of S. 10, T. 11, R. 5 E., there is a ledge of good *soft ore* about 15 inches thick. This ore is very fossiliferous, and badly weathered samples are full of yellowish specks, the remains of fossils. These badly weathered samples are also porus. Just to the north-east there is one more low hill or knoll of the rocks of this formation and then these rocks are engulfed in the fault for several miles to the north-east. Along this gap of several miles there is a valley about 100 yards wide between ridges of (c) *Siliceous* (*Knox*) *Dolomite and Chert* on the south-east and (h) *Coal Measures* on the north-west. At the north-east end of this valley or in the S. E. ¼ of N. E. ¼ of S. 35, T. 10, R. 5 E., there is a high short ridge or long hill with on its top and north-west side the rocks of this formation, in contact with (b) *Siliceous* (*Knox*) *Chert* strata on the south-east. The north-west foot of this ridge or hill is within 50 yards of the foot of Raccoon Mountain (Coal Measures), with a fault between. On the top of this hill, there is a shaft down on an ore outcrop. This ore seam on the outcrop is made up of alternate streaks of ore and shale, and in the shaft it, as alternate streaks of ore and shale, has about 18 inches of shale over it to a seam of ore that on one side of the shaft is about 12 inches thick and on the other side is about 18 inches thick. It is said by the *knowing ones*, though not believed, that when this seam got 20 feet below the surface it would be free of shale and would have from 4 to 5 feet in thickness of ore. The dip in the shaft is about 40 deg. to the south-east. To the north-east, along the strike, for some distance, the country is comparatively low, though some, at least, of the strata of this formation are believed to be continous across it. In it, an ore outcrop, said to be three feet thick, shows in a branch in the S. W. ¼ of S. W. ¼ of S. 36, T. 10, R. 5 E. To the north-east, in the S. W. ¼ of N. W. ¼ of S. 30, T. 10, R. 6 E., a ridge of the rocks of this formation again sets in. This ridge is about ½ mile long and shows ore outcrops for its whole length. In one of these outcrops, there is about the following section:

Outcropping in the N. E. ¼ of S. 30 T. 10, R. 6 E.

[5] Shale, *Ore;* the ore is merely a thin streak in the lower part of the shale.	
[4] *Ore;* reported to be a little over 3 feet thick, it shows on the outcrop	2 ft. 6 in.
[3] Shale	1 ft. 2 in.
[2] *Ore*	4 in.
[1] Shale.	

The dip of this outcrop is about 65 deg. to the ESE., the strike being about N. 30 deg. E.

To the north-east of a gap, in which the rocks of this formation are engulfed in a fault, there crosses the road at the foot of the Siliceous (Knox) Chert ridges in the S. W. corner of S. 17, T. 10, R. 6 E. two seams of ore about 75 feet apart. The north-western or upper of these seams look as if it might be about 3 ft. 6 in. thick. Its dip is about 75 deg. to the south-east. Some 200 yards farther to the north-east, in an old pit on top of a low ridge,, out in an old field in the S. E. ¼ of S. W. ¼ of S. 17, T. 10, R. 6 E., there is the following outcropping:

Outcropping in the S. E. ¼ of S. W. ¼ of S. 17, T. 10, R. 6 E.

[4] *Ore;* good, not quite	2 ft. 0 in.
[3] Shale; about	8 ft. 0 in.
[2] *Ore*	1 ft. 6 in.
[1] Shale.	

This seam of ore appears to be continuous from here on to the north-east, along the foot of the Siliceous (Knox) Chert ridges, for some ¾ mile. It crosses the road just to the north-east of Luck Spring P. O., near the county line, in the N. W. ¼ of N. W. ¼ of S. 9, T. 10, R. 6 E.

of yellowish specks, the remains of fossils. These badly weathered samples are also porus. Just to the north-east there is one more low hill or knoll of the rocks of this formation and then these rocks are enguifed in the fault for several miles to the north-east. Along this gap of several miles there is a valley about 100 yards wide between ridges of (c) *Siliceous* (*Knox*) *Dolomite and Chert* on the south-east and (h) *Coal Measures* on the north-west. At the north-east end of this valley or in the S. E. ¼ of N. E. ¼ of S. 35, T. 10, R. 5 E., there is a high short ridge or long hill with on its top and north-west side the rocks of this formation, in contact with (b) *Siliceous* (*Knox*) *Chert* strata on the south-east. The north-west foot of this ridge or hill is within 50 yards of the foot of Raccoon Mountain (Coal Measures), with a fault between. On the top of this hill, there is a shaft down on an ore outcrop. This ore seam on the outcrop is made up of alternate streaks of ore and shale, and in the shaft it, as alternate streaks of ore and shale, has about 18 inches of shale over it to a seam of ore that on one side of the shaft is about 12 inches thick and on the other side is about 18 inches thick. It is said by the *knowing ones*, though not believed, that when this seam got 20 feet below the surface it would be free of shale and would have from 4 to 5 feet in thickness of ore. The dip in the shaft is about 40 deg. to the south-east. To the north-east, along the strike, for some distance, the country is comparatively low, though some, at least, of the strata of this formation are believed to be continous across it. In it, an ore outcrop, said to be three feet thick, shows in a branch in the S. W. ¼ of S. W. ¼ of S. 36, T. 10, R. 5 E. To the north-east, in the S. W. ¼ of N. W. ¼ of S. 30, T. 10, R. 6 E., a ridge of the rocks of this formation again sets in. This ridge is about ½ mile long and shows ore outcrops for its whole length. In one of these outcrops, there is about the following section:

Outcropping in the N. E. ¼ of S. 30 T. 10, R. 6 E.

[5] Shale, *Ore;* the ore is merely a thin streak in the lower part of the shale.	
[4] *Ore;* reported to be a little over 3 feet thick, it shows on the outcrop	2 ft. 6 in.
[3] Shale	1 ft. 2 in.
[2] *Ore*	4 in.
[1] Shale.	

The dip of this outcrop is about 65 deg. to the ESE., the strike being about N. 30 deg. E.

To the north-east of a gap, in which the rocks of this formation are engulfed in a fault, there crosses the road at the foot of the Siliceous (Knox) Chert ridges in the S. W. corner of S. 17, T. 10, R. 6 E. two seams of ore about 75 feet apart. The north-western or upper of these seams look as if it might be about 3 ft. 6 in. thick. Its dip is about 75 deg. to the south-east. Some 200 yards farther to the north-east, in an old pit on top of a low ridge,, out in an old field in the S. E. ¼ of S. W. ¼ of S. 17, T. 10, R. 6 E., there is the following outcropping:

Outcropping in the S. E. ¼ of S. W. ¼ of S. 17, T. 10, R. 6 E.

[4] *Ore;* good, not quite	2 ft. 0 in.
[3] Shale; about	8 ft. 0 in.
[2] *Ore*	1 ft. 6 in.
[1] Shale.	

This seam of ore appears to be continuous from here on to the north-east, along the foot of the Siliceous (Knox) Chert ridges, for some ¾ mile. It crosses the road just to the north-east of Luck Spring P. O., near the county line, in the N. W. ¼ of N. W. ¼ of S. 9, T. 10, R. 6 E.

It is here pushed over to the north-west until its dip on the outcrop is 45 deg. to 85 deg. to the south-east. Just to the north-east of Duck Springs P.O. a high ridge of the rocks of this and the overlying formation, starts up. The outcrops on the south-east side of this ridge are bent over to the north-west until they have a dip of about 60 deg. to the south-east, they are just to the north-west of the fault. A little to the south-east of the north-east end of this high ridge, there is an outcropping of an ore seam that runs under Mr. George Gilbreth's house and that just to the north-east of the house or in the N. E. corner of N. W. ¼ of S. 9, T. 10, R. 6 E. shows up as follows:

Outcropping in the N. E. Corner of N. W. ¼ of S. 9. T. 10, R. 6 E.

(3)	Shale; visible, about	4 ft. 0 in.
(2)	*Ore*; *soft*, good, solid ledge, about	1 ft. 3 in.
(3)	Debris	

In this old pit, there is a break in the ore; the ore is several feet farther to the north-west on the north-east side than on the south-west side of the pit. Its strike is about N. 30 deg. E. and its dip is about 40 deg. to the ESE. Some 60 yards farther to the north-east, there is in the road the following outcropping:

Outcropping in the Road in the N. W. ¼ of S. 9, T. 10, R. 6 E.

(7)	Debris.	
(6)	*Ore*; *soft*, good, ledge, (2) of last section, about	1 ft. 3 in.
(5)	Shale, about	15 ft. 0 in.
(4)	*Ore*; may have some shale partings in its upper part, about	2 ft. 0 in.
(3)	Shales, Sandstones, from	6 to 8 ft. 0 in.
(2)	*Ore*, Sandstone; in alternate streaks, the upper ore is shaly, about	4 ft. 0 in.
(1)	Debris	

The dip of this outcrop is about 50 deg. to the south-east.

The ridge (East Red Mountain) on the south-east side of Wills Valley is, as a general thing, much higher than the one on the north-west side (West Red Mountain.) It is a considerable mountain of continous strata. The upper of its strata in an outcrop in a ravine or hollow on its south-east side near the county line have a dip of about 20 deg. to the south-east. In the upper of these strata, there is a seam of good ore about 18 inches thick. Along the road over the ridge just to the north-east of Greenwood (Keener) Station or in the N. E. ¼ of S. W. ¼ of S. 13, T. 10. R. 6 E., this formation, made up principally of interstratified shales and sandstones, is about 375 feet thick.

A seam of ore crops out in a ravine on the south-east side of the mountain near Tom Taylor's, Col., in the S. E. ¼ of N. W. ¼ of S. 14, T. 10, R. 6 E. It is about 30 inches thick, but only 5 to 6 inches of it is of good ore. Its top 5 to 6 inches, of a deep blood red color, resembling somewhat a compact limonite, is argillaceous, and its next 15 to 20 inches of ore, to the good ore, soft and fossiliferous, at the bottom, is shaly. The dip of this ore is not much greater than the fall in the ravine and so its outcrop shows for a considerable distance, It is but a few feet over some massive sandstones. Along its outcrop about ½ mile to the south-west, there is a great deal of good loose ore scattered over the south-east side of the ridge near the top. This loose ore sets in all at once on the south-west side of a narrow gap, over an outcropping of red shale. On the north-east side of this gap, there is an outcropping of a yellow shale and no visible ore. The seam of good ore from which all of this loose ore comes is believed to be not over 12 inches thick, and very likely it is less. Some of the loose pieces of ore are partly nothing more than a fine grain ferruginous sandstone. The ore outcrop is in waves with a north-west and south-east trend, at right-angle to the general strike of the rocks. The higher points of the mountain and of the outcrops of this seam of ore correspond to the billows, and the lower points to the troughs of the waves. In the troughs or low places of the mountain, the outcrops of this seam of ore are down on the south-east side of the mountain. The massive sandstone just under it crops out as a ledge along the north-west crest of the mountain, though it sometimes, opposite the high points, gets down on the north-west side of the mountain.

The outcrop of an ore seam, over the above ore outcropping or higher up in the formation than (11) of the last section, on the south-east side of the mountain at a gap in the S. E. ¼ of N. E. ¼ of S. 5, T. 11, R. 6 E., has been drifted into for some 8 to 10 feet. At this drift, there are the following sections:

Section in the S. E ¼ of N. E. ¼ of S. 5, T. 11, R. 6 E.

1st. At the Mouth of the Drift.

[9]	Shale; yellow, visible about	3 ft. 0 in.
[8]	Sandstone	2 in.
[7]	Shale; yellow	1 ft. 0 in.
[6]	Shale, *Ore;* the ore is in streaks in the shale, about	1 ft. 6 in.
[5]	Shale; of a yellow color	1 ft. 9 in.
[4]	*Ore*	1 to 2 in.
[3]	Shale, *Ore*	3 in.
[2]	*Ore*; good, soft	1 ft. 6 in.
[1]	Shale; visible to a depth of	6 in.

2nd. At the Head of the Drift.

[5]	Shale; cover.	
[4]	*Ore*, Shale	3 to 4 in.
[3]	Shale	1 in.
[2]	*Ore*	1 ft. 5 in.
[1]	Shale; visible to a depth of	3 ft. 0 in.

Along the road over the ridge at the Broughton Bridge Gap in the N. E. ¼ of N.E. ¼ of S. 7,T. 11,R. 6 E., there is the following outcropping:

Outcropping along Road over Ridge in N. E. ¼ of N. E. ¼ of S. 7 T 11, R. 6 E.

[14]	Sandstones with some interstratified shales and loam, about	225 ft. 0 in.
[13]	Shale, *Ore*; in alternate streaks	10 in.
[12]	Sandstone; very hard, called *cap rock* to ore	2 in.
[11]	Shale	2 in.
[10]	*Ore*	2 in.
[9]	Shale	2 in.
[8]	*Ore*	1 ft. 2 in.
[7]	Shales with interstratified sandstone, about	100 ft.
[6]	*Ore*; good and *soft*, outcrop about	3 ft.
[5]	Shales, Sandstones; about	175 ft.
[4]	Shales, *Ore*; the ore very sandy and in thin seams in shale	10 ft.
[3]	Loam; sandy, red, with loose shales, about	80 ft.
[2]	Loam, *Ore*; the ore sandy and in loose pieces in red sandy loam, about	10 ft.
[1]	*Pelham* [*Trenton*] *Limestones.*	

To the north-east of the above gap for about ¼ mile, the ore (8) above has beeen surface dug to a considerable extent. The following 4 sections were taken at different places in these old surface diggings.

Section in Ola Surface Diggings in the S. E. ¼ of N. E. ¼ of S. 8, T. 11, R, 6 E.

1st. Section.

(6)	Shales; with seams of hard flaggy sandtones, from	6 to 8 ft. to 0 in.
(5)	*Ore*	2 in.
(4)	Shale	2 in.
(3)	Sandstone; in two thin seams with a sheet of shale between	4 in.
(2)	Shale, *Ore;* in alternate streaks	8 in.
(1)	*Ore*	1 ft. 8 in.

2nd Section.

(10)	Shales; with some hard flaggy sandstones, about	6 ft. 0 in.
(9)	Shales	2 in.
(8)	*Ore*	2 in.
(7)	Shale	1 in.
(6)	*Ore;* from	1 to 2 in.
(5)	Shale; hard, from	1 to 2 in.
(4)	*Ore*	2 in.
(3)	Shale; only in places	0 to 1 in.
(2)	*Ore*	1 ft. 7 in.
(1)	Shale; visible	2 in.

3rd Section.

(16)	Shale; with hard flaggy sanstones, about	10 ft.
(15)	*Ore*; from	1 to 2 in.
(14)	Shale	½ in.
(13)	*Ore*	1 in.
(12)	Shale; from	1 to 2 in.
(11)	Sandstone; flaggy	2 in.
(10)	Shale	8 in.
(9)	*Ore*; from	1 to 2 in.
(8)	Shale	½ in.
(7)	*Ore*; from	1 to 2 in.
(6)	Shale; from	1 to 2 in.
(5)	*Ore*	1 ft. 6 in.
(4)	Shale	6 in.
(3)	*Ore*	½ in.

(2)	**Shale**	**1 in.**
(1)	***Ore;*** **visible to a depth of**	**2 in,**

4th Section.

[17]	**Shales; with some hard flagstones, about**	**10 ft. 0 in.**
[16]	***Ore***	**1 in.**
[15]	**Shales; from**	**1 to 2 in.**
[14]	***Ore***	**1 in.**
[13]	**Shale, *Ore*; gradually passing into each other**	**2 in.**
[12]	**Shale**	**1 in.**
[11]	**Sandstone; flaggy**	**2 in.**
[10]	**Shale**	**2 in.**
[9]	***Ore***	**1 in.**
[8]	**Shale**	**¼ in.**
[7]	***Ore;*** **from**	**1 to 2 in.**
[6]	**Shale**	**4 in.**
[5]	***Ore***	**4 in.**
[4]	**Shale**	**1 in.**
[3]	***Ore;*** **from**	**2 to 3 in.**
[2]	**Shale; only in places**	**½ in.**
[1]	***Ore;*** **limy and *hard*, visible to a depth of**	**1 ft. 3 in.**

An average sample of the ore from six different places in the above old diggings, on being dried at 100 deg. C. gave the following analysis:

Ferric Oxide	60.691
Silica	10.508
Phosophric Acid	1.017

Since the above was written, the ore near the above gap has been mined considerably. It is said to be from 3 to 6 feet thick down in the mines, but to thin out to only 18 inches in a short distance on the outcrop both to the north-east and south-west.

This outcropping is in waves that rise and fall with respectively the high points and low places or gaps of the mountain, the billows of the waves corresponding to the high points of the mountain and the troughs of the waves to the low points or gaps. The above seam or ore to the south-west to Attalla crops out on the north-west side of the mountain opposite the high points and on the south-east side opposite the low points. Its outcrop can be very easily traced by the loose ore over the surface.

At the "Low Gap" about one mile north of Attalla and to the north-east for over ½ mile and to the south-west to the end of the mountain, there are two seams of ore about 30 feet apart. About ½ mile to the north-east of this gap, the lower seam, here the main seam, has been worked some, though at the gap and to the south-west of the gap, the top seam is the main seam, the lower seam being only 6 to 8 inches thick. The upper seam has been and is now being extensively worked near Attalla. An outcrop of the bottom seam about ½ mile north-east of the "Low Gap" has a few feet under it a hard massive sandstone of a grayish yellow color and some 75 feet over it a fine grain sandstone of a yellowish color. In some surface diggings on the outcrop of the upper seam just to the north-east of the "Low Gap," there is the following section :

Outcropping just to the N. E. of the "Low Gap" in the N. E. ¼ of S. E. ¼ of S. 34, T. 11, R. 5 E.

[7]	Shales, Sandstones; the sandstones are flaggy and are in seams about 2 inches each in thickness, about	12 ft. 0 in.
[6]	*Ore*, Shales; in alternate streaks, the ore is shaly	1 ft. 6 in.
[5]	Sandstone; flaggy, hard and ferruginous, breaking like flint, called *cap rock*	8 in.
[4]	Shale	1 ft. 0 in.
[3]	Sandstone; flaggy, similar to [5]	2 in.
[2]	*Ore;* good *soft*	2 ft. 8 in.
[1]	Shale.	

Just to the south-west of this last section, in the same diggings, there is a break and lap in the ore in the general direction of the ridge or in a north-east and south-west direction. This break was made by a north-east force exerting itself towards the south-west.

The upper seam is worked by means of a slope at the "Low Gap." At the mouth of the slope, there is the following section.

Section at the "Low Gap" in the N. E. ¼ of S.E. ¼ of S. 34, T. 11, R. 5 E.

[13]	Sandstone; soft and of a yellowish color, about	50 ft. 0 in.
[12]	Sandstone; shaly, full of fossils, from	6 to 8 ft. 0 in.
[11]	Sandstone; in strata of about 2 feet each in thickness, gray, about	15 ft. 0 in.
[10]	Sandstone; similar to [13], about	50 ft. 0 in.
[9]	Sandstone; gray color, very hard, called *granite*, about	40 ft. 0 in.
[8]	Debris, Shale; about	20 ft. 0 in.
[7]	Shale, about	30 ft. 0 in.
[6]	*Ore*, Shale; in alternate streaks, the ore is shaly, from	2 ft. to 2 ft. 6 in.
[5]	Sandstone, ferruginous and calcareous, very hard, breaking like flint and called *cap rock*, it seems to thicken as the ore thickens, about	8 in.
[4]	Shale	2 ft. 0 in.
[3]	*Ore*; good	4 ft. 0 in.
[2]	Shale; about	30 ft. 0 in.
[1]	Sandstone; hard, bluish and calcareous, called *bed rock*, from	40 to 50 ft. 0 in.

This slope has been sunk down on the ore to a depth, on Aug. 5, 1887, of about 600 feet. Down to this depth, the ore and the dip, from 30 deg. to 35 deg. to the south-east, had both remained about constant. The ore cars are let down an incline, from the mouth of the slope on top of the mountain to the south-east foot of the mountain, by steam and then pulled by mules to the shoot about ½ mile distant on the Alabama Great Southern Railroad.

the "Low Gap" is now mined, by Mining Company, through a tunnel at the south-east foot of the mountain some 300 feet from the outcrop on or leached ore here extends from 150 on the dip from the outcrop. The line ores is sharp and distinct, though of *soft* or leached ore extending down limy ore and boulders of the *hard* or ring in the *soft* ore. The ore of this mine Chattanooga.

has been surface dug for about a mile to the of the above "Low Gap" and for about one miles to the south-west of that gap. The ore thins down to about 18 inches thick in both directions. An outcropping just to the south- the above gap is about as follows:

Sandstones; yellowish gray with greenish	
Shale; very hard shaly ore full of fossil corals, called "*the ore blossom*"	6 to 8 in.
[illegible]	18 in.
Sandstone; very hard, yellowish, "*cap rock*", fine cover	8 in.
Shale, frequently so hard in the mines as to have to be blasted	18 in.
[illegible]	36 to 42 in.

The ore outcrop some ¼ mile to the south-west of the "Low Gap" is about 3 feet thick. About ¼ mile still farther to the south-west, it is about vertical to a depth of some 30 feet and then suddenly bends to its usual dip of 30 deg. to 35 deg. to the south-east. In the vertical portion, it is generally thinner than usual, though here it varies in thickness from 2 to 4 feet, and, strange to say, immediately at the sharp bend it is generally thickest. An average sample of the leached or weathered ore, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	77.024
Silica	8.387
Phosphoric Acid	1.550

The *Moragne Mines* are about 1 and ½ miles to the north-west of the Attalla depot. The ore of this mine is brought through a tunnel down on the south-east side of the mountain, This tunnel is about 240 feet long from its mouth to where it strikes the ore. The ore in this mine is about 2 ft. 8 in. thick. The ore is dumped into shoots at the mouth of the tunnel and from them into small cars which are pulled by a dummy engine to the shoot on the Alabama Great Southern Railroad near the old depot. Some of the sandstones near the mouth of the tunnel are full of casts of *Pentamerus oblongus*.

About ¼ mile to the south-west of the Moragne Mine, the Red Mountain (Clinton) and Sub-carboniferous Chert ridge bends around to a ESE. course. The ore outcrop follows this course for about ½ mile and then bends towards the SSW., getting near the west foot of the mountain. It keeps this last direction for about ¼ mile to where, as it curves towards the S. E., it is stopped or cut off by a fault. The ore at the first of these bends is about 2 ft. 6 in. thick; at the second it is about vertical on the outcrop and is only about 2 feet thick; at the third it has a shaly parting and is only about 18 inches thick; and at its end or near the end and west foot of the mountain it is only about 8 inches thick on the outcrop with a dip of about 45 deg. to the north-east. The ore on the outcrop between the first and second bends was, in Aug. 1887, being surface dug and hauled in wagons to the Attalla depot. In an outcropping near its end or near the end of the mountain, it has about the following section:

Outcropping Near the End of the Ridge Just West of Attalla

(5) Shale; from..............	4 to 5 ft. 0 in.
(4) Sandstone; flaggy	2 to 3 in.
(3) Shale.....................	2 ft. 6 in.
(2) *Ore;* with shale partings in its upper part......	8 in.
(1) Shale; visible, about....	4 ft. 0 in.

The dip of this outcrop is about 50 deg. to the NNE.

Near Attalla, in Aug. 1887, only *soft* or leached ore was mined, at there was then not any demand or sale for the *hard* or limy ore. The ore was therefore, in some places at least, mined at a great disadvantage and at a greater cost than had the hard or limy ore also been wanted. Of late years, however, the *hard* or *limy* ore is also mined, as it is in demand.

To the WSW. of the first sharp bend in the mountain to the north-west of Attalla, there is, on the west bank of Big Wills Creek, in the S. W. ¼ of N. E. ¼ of S. 4, T. 12, R. 5 E., a small outcropping of the rocks of this formation that appears to be a contiunation of those in the Attalla ridge, though isolated or cut off from them by a fault and older strata. This outcrop is just to the north of a fault, and its strata, together with the adjacent rocks, are badly broken up. It is of thick flaggy sandstones with thin interstratified seams of a shaly rock. These flagstones are of a gray color, they are fossiliferous and some of the more massive are a fine grain conglomerate with very small flint pebbles. This outcrop shows a thickness of only 7 to 8 feet; its strike is north-east and its dip is about 80 deg. to the south-east.

Maj. G. D. Fitzhugh, in his report on the region along the A. & C. R. R., speaks of the ore near Attalla, thus:

"The seam is about 3½ feet thick......The upper part of the seam is *soft* ore......The analysis of the ore from the mine near Attalla shows:

Silica	4.55
Metallic Iron	45.36
Manganese	0.30
Lime	14.40
Alumina	3.82
Sulphur	Trace
Phosphorus	0.41
Water at 212 F	0.10

Analyst:—W. B. Phillips.

"Two seams of Red Ore occur here.

The red ore ridge or "Little Mountain" to the south-east of Lookout Mountain ends suddenly on the south-west or is cut off by a transverse fault in the northern edge of Gadsden. At this south-west end, along the fault, the Red Mountain (Clinton) strata are in contact with (a) *Coosa* (*Flatwood*) *Shales and Limestones* on the south-west. The ore of this "Little Mountain" has been worked by surface diggings and by slopes to its very south-west end or to within a few steps of the fault.

The ore outcrop on the south-west end of this mountain, because of waves in it, is in places almost flat and in other places has a dip of only 15 deg. to 20 deg. to the north-west. It however in but a short distance below the surface gets to be about vertical. The ore about 125 feet below the surface, in a slope at the end of the mountain, is more than vertical or has a dip of about 85 deg. to the south-east. It is therefore, down to this depth at least, in wrinkles. The strike on the end of the ridge is about N. 30 deg. E., though at the extreme point of the sloping end it appears to bend to a more east and west direction. The ore outcrop near this end of the mountain is down on the south-east side of the mountain, some 15 to 20 feet below the top. The ore is a good *soft* ore from 30 to 36 inches thick. It has, however, a thin shale parting near its center. It has been surface dug nearly all along from the south-west end of the mountain for some 2 miles to the north-east and then at intervals for some four miles farther. The ore gets to be quite thin still farther to the north-east. Within the first 2 miles at the south-west end, the ore has been mined through tunnels that start in near the south-east foot of the mountain. There are three of these tunnels, though the most south-west one is not now used.

Maj. G. D. Fitzhugh, in his report on the region along the A. & C. R. R., speaks of this ore, thus:

"About a half-mile west of the furnace of the Gadsden Iron Company are the Red Ore Mines of Balcombe & Sullivan. The seam of ore is 3½ feet thick......dipping to the north-west at an angle of about 80 deg.

"The ore is worked from two drifts about 300 yards apart. Drift No. 1, nearly 145 feet above the general level of the valley, is 250 feet long. The ore is mined upward from the drift on the seam to its outcrop on the crest of the mountain, a distance of 110 feet. It is *soft ore* and is hauled in wagons to the furnace.

"Drift No. 2, about 70 feet above the general level of the valley, is 550 feet long. As in Drift No. 1, its ore is mined upward from the drift on the seam for about 100 feet to the level of Drift No. 1. This part of the seam is *hard ore*. It is hauled in wagons to the furnace. An analysis of the ore of these mines shows:

Silica	9.20
Metallic Iron	54.94
Maganese	0.30
Lime	3.20
Alumina	4.48
Sulphur	Trace
Phosphorus	0.30
Water at 212 F	1.10

Analyst:—W. B. Phillips.

There is just under those at the south-west end of the mountain a dark ferruginous shale 5 to 6 inches thick that is so ferruginous as to be a very good ore, good enough to be mined and shipped. Under this ferruginous shale 4 to 5 feet, there is a dark colored fine grain ferruginous sandstone that in about one mile to the north-east from the end of the mountain becomes in places a very good hard compact sandy ore. It has however never been worked any, being as a general thing too sandy and of very variable quality. It occurs in some places as a hard solid ledge about 20 inches thick, though in most places it is in two ledges that are separated from each other on the outcrop by a few inches of debris that most likely hides a thin parting of shale. It shows in two of its outcrops about as in the following sections

Sections near the Center of S. 35, T. 11, R. 6 E.

1st Section.

(3)	*Ore*; good and solid, a ledge	1 ft. 1 in.
(2)	Debris	3 in.
(1)	*Ore*; good, ledge	3 in.

2nd Section.

(4)	*Ore*; solid ledge	11 in.
(3)	Debris; about	8 in.
(2)	*Ore*; shaly, visible	1 ft. 1 in.
(1)	Debris	

These outcrops here are along the top of the mountain, which is low, and along the south-east edge of the surface diggings of the overlying ore. An average sample of the leached ore from four different places of this lower unworked ore on being dried at 100 deg. C., gave the following analysis:

Ferric Oxide	50.964
Silica	23.728
Phosphoric Acid	0.716

Analyst:—J. L Beeson.

The top ore in about ¼ mile to the northeast is also worked through a tunnel down on the south-east side of the mountain. In the surface diggings along the top of the mountain over this tunnel, the following two sections were taken:

Sections near the Center of N. E. ¼ of S. 35, T. 11, R. 6 E.

1st Section

(5)	Shale, *Ore*; the shale of a dark color has the ore in small quantities in it, about	1 ft. 2 in.
(4)	*Ore*; good	3 ft. 8 in
(3)	Shale, Sandstone; the sandstone in thin seams in the shale	2 ft. 4 in.
(2)	Shale	2 ft. 0 in.
(1)	Shale, *Ore*; the ore is in small quantity in the shale, about	2 ft. 0 in.

2nd Section.

About 25 yards to the N. E. of 1st Section.

(6)	Shale; yellow, about	3 ft. 0 in.
(5)	Shale, *Ore*; the shale is of a dark color, the ore is in small quantity in the shale	1 ft. 2 in.
(4)	*Ore*; good, top of worked seam	3 ft. 8 in.
(3)	Shale; of yellow and dark colors, from	5 to 6 ft. 0 in.
(2)	*Ore*; the second or lower seam	2 ft. 0 in.
(1)	Shale	

The ore (4) of the last section has in it, from 4 to 6 inches above its bottom, a thin parting of shale. Average samples of its full thickness on the outcrop and in a drift gave the following analysis:

	(1)	(2)
Ferric Oxide	61.298	75.730
Silica	7.516	10.795
Phosphoric Acid	0.435	0.616

(1) Average sample of the soft and well leached ore from two different places on the outcrop, 44 inches thick. Dried at 160 deg. C. Analyst:—J. L. Beeson.

(2) A well leached ore from the drift, with some flattened grains and a few almost obliterated fossils.—Analyst:—J. L. Beeson.

The lower seam (2) of the latter of the above two sections has the following detail section:

Detail Section of (2) of Last Section.

(2)	*Ore;* good in thin flat pieces	10 in.
(2)	*Ore;* usually sandy, sometimes good	8 in.
(1)	*Ore;* good, solid	6 in.

These outcrops are in short or sharp wrinkles. The wrinkles extend at the least over 100 feet below the surface, but how much farther there was no way of telling when visited in 1875. The ore, wherever it has been seen, is continuous around the sharp bends of the wrinkles, but in some of these bends it is much thinner than elsewhere or is almost squeezed out. Some ¾ mile farther to the north-east, the mountain is almost flat on top, doubtless from the strata on the outcrop flattening or being in waves.

The upper ore seam along here crops out down on the south-east side of the mountain and has been extensively surface dug. These surface diggings are continued until the cover is from 8 to 10 feet thick. The ore is from 32 to 48 inches thick. It is frequently thinner immediately on the outcrop than it is a few feet below the surface and it sometimes has a thin shale parting about 16 inches from its bottom. It is here also in wrinkles, as can be seen in these surface digging. The dip immediately on the outcrop is almost invariably to the north-west and not so steep as it is a few feet below the surface. The ore seam of these diggings has just over it a dark colored shale about 14 inches thick, with three to four irregular seams of ore about one inch each in thickness, to a yellowish shale with thin seams of sandstone. It has about 4 inches under it, in shale, an irregular ore seam about 2 inches thick. The shale between this irregular streak or thin seam of ore and the main ore seam is in places, as has already been stated, so ferruginous as to be a very good ore, good enough to mine and ship. In these surface diggings, the following three sections were taken :

Section in the S. W. ¼ of S. W. ¼ of S. 25. T. 11, R. 6 E.

1st. Section.

[8]	Shale	15 to 20 ft. 0 in.
[7]	*Ore;* about	3 ft. 4 in.
[6]	Shale, *Ore;* the ore in streaks in the upper part of the shale	2 ft 0 in.
[5]	Shale, *Ore;* shale, arenaceous and of a dark color with the ore in a few irregular thin streaks	1 ft. 1 in.
[4]	Shale; yellow and dark colors, about	2 ft. 0 in.
[3]	Shale, *Ore;* shale of a dark color with a little ore	1 ft. 2 in.
[2]	Shale; yellow, about	5 ft. 0 in.
[1]	Sandstone; thick flags, fine grain and of a brown color, soft, about	20 ft.

2nd Section.

[6]	Shales; of light and yellowish colors.	
[5]	Shale, *Ore;* shale of a dark color with the ore in thin irregular seams or streaks	8 in.
[4]	*Ore*, Clay; the clay is only in places, it is in thin streaks in the ore	8 in.
[3]	Clay	0 to 2 in.
[2]	*Ore;* good, solid ledge	3 ft. 5 in.
[1]	Shale.	

3rd Section.

[4]	Shale; of a light yellow color, visible	6 ft. 0 in.
[3]	Shale, *Ore;* shale of a dark color with the ore in thin seams	1 ft. 2 in.
[2]	*Ore;* good	3 ft. 11 in.
[1]	Shale.	

Down in the slope at this place, the ore, measured in a half dozen places, varied from 44 to 47 inches in thickness with an average thickness in these six places of about 46 inches. It has in it, about 14 inches from its top, a streak about 3 inches thick that is much more limy than the rest of the seam. The upper part of the seam, however, especially in places, is much softer ore than the bottom part, which is sometimes very hard and compact, resembling somewhat a limonite. This ore has some fossil corals in it, though it is not as fossiliferous here as in other places. Its dip down in the slope about 150 feet from the outcrop, is from 75 deg to 80 deg. to the north-west. Average samples of this ore from the outcrop and from some 150 feet down on the dip, on being dried at 105 deg. C., gave the following analyses:

	(1)	(2)
Ferric Oxide	79.934	58.695
Silica	7.651	6.230
Phosphoric Acid	0.933	1.488
Lime Carbonate	——	29.758

(1) A leached ore from four different outcrops with a thickness of from 32 to 47 inches. Some of it has small flattened siliceous grains and some of it is fossiliferous. Analyist, J. L. BEESON.

(2) A *hard* or limy ore from head of the tunnel about 150 feet down on the dip. It has in it some unusually large rounded flint pebbles, of the size of beans, and some light grayish calcareous

splotches. It is from 44 to 47 inches thick with an average thickness of about 46 inches. Analyst, J. L. BEESON.

Some ½ mile still farther to the north-east or about 2 and ½ mile from Gadsden, at the end of the Mineral Railroad in Sept. 1887, the ore had been extensively worked by means of surface diggings, slopes, and drifts. Just to the south-west of these mines, the ore crops out along the south-east crest of the mountain, as a ledge from 18 to 28 inches thick. An average sample of it from two different places on the outcrop gave the following analysis :

Ferric Oxide	69.609
Silica	3.090
Phosphoric Acid	0.171

Analyst, J. L. BEESON.

This ledge is of the harder or lower part of the seam, the softer or upper part, from 4 to 15 inches thick, not showing along here in the outcrops. Along this ledge, there are loose boulders of ore of the full thickness of the ledge, from 4 to 5 feet long and from 2 to 3 feet wide. At these mines, the ore outcrops and hence the surface diggings and slopes are down on the south-east side of the mountain some 15 to 20 feet below the top. On the north-east side of one of the old slopes, there is the following section :

Section about 2 and ½ miles North-east of Gadsden.

[9]	*Ore;* good	2 ft. 8 to 9 in.
[8]	Shale ; of a yellowish color	2 ft. 6 in.
[7]	*Ore;* good	2 in.
[6]	Shale, Sandstone ; the sandstone is shaly and is in thin seams in the shale, about	4 ft. 0 in.

[5]	Shale, *Ore:* the ore is in small quantity in the shale	2 ft. 8 in.
[4]	Shale; of a dark color	1 ft. 0 in.
[3]	*Ore*, Shale; in alternate streaks	4 in.
[2]	*Ore*	5 in.
[1]	Sandstone; massive though flaggy, from	15 to 20 ft.

The dip of (1) is about 50 deg. to the north-west.

The ore here at the mouth of an old slope that was used for introducing props into the mines, is from 32 to 33 inches thick. The dip is about 60 deg. to the north-west. The ore, from its sections at these mines and at outcrops to the north-east, shows that it is getting thinner towards the north-east, while the formation is thickening up in this same direction. The outcrop of an other ore seam was seen some 6 miles from Gadsden. It is near the top of the formation. The ore that is worked to the south-west is reported to be not over 8 to 10 inches thick in T. 11, R. 7, E., S's. 18, 8, & 4. The formation along here must be fully 600 feet thick. Its upper strata are calcareous and become more so to the north-east.

The ore outcrops in the N. E. ¼ of S. 35, T. 10, R. 7. E. are reported to be from 16 to 18 inches thick. Those in the N. E. ¼ of N. E. ¼ of S. 25, T. 10, R. 8 E. are about 2 feet thick with near their bottoms a thin shale parting. On the south-west side of a gap near the county line or in the S. W. ¼ of S. 24, T. 10, R. 7 E. there is the following outcropping:

Outcropping in the S. W. ¼ of S. 24, T. 10, R. 7 E.

[7]	Sandstones; a thick bed.	
[6]	Shales, Sandstones; the sandstones are thin flaggy seams in the shale.	
[5]	*Ore*; solid, compact, good	1 ft. 6 in.
[4]	Shales; Debris	1 to 2 in
[3]	*Ore*	5 in.

[2]	Shale	8 to 10 in.
[1]	Sandstone.	

The dip of this outcrop is about 75 deg. to the north-west.

Leeth Mountain is made up of this formation, except the foot of its steep north-west side. It is on the opposite or south-east side of a broken faulted unsymmetrical anticlinal from the above Little Mountain or strip of (Red Mountain) Clinton strata just to the south-east of Lookout Mountain. It starts up in the S. W, ¼ of N. E. ¼ of S. 2, T. 11, R. 7 E., and runs to the south-west for about one mile. It is just to the north-west of the Rome and Cahaba Thrust Fault which brings its strata on the south-east in contact with those of *[illegible] Coosa (Flatwood) Shales and Limestones.* A seam of ore from 8 to 10 inches thick crops out along just to the south-east of the top of this mountain. This ore is of good quality and breaks up in blocks of its full thickness. It carries rounded flattened siliceous grains and is very fossiliferous. An average sample of its full thickness, on being dried at about 100 deg. C., gave the following analysis:—

Ferric Oxide	84.202
Silica	7.496
Phosphoric Acid	0.902

Analsyst:—J. L. BEESON.

The ore is about vertical on the outcrop but at the bottom of the digging, 8 to 10 feet deep, dips about 70 deg. to the south-east. Its cover is of yellowish and reddish shales, and, a few feet under it, there is a seam of ferruginous sandstone of about its own thickness that breaks up into similar blocks. An other seam of ore, about 22 inches thick with a clay streak near its bottom, is said to occur in this mountain. This second seam may furnish the loose ore that covers the south-east foot of the mountain. This loose ore covers a knoll that is some 300 yards to the south-east of the ore outcrop along the top of the mountain and between these points, or on the side of the mountain, there is not much loose ore.

The ridge or belt of this formation that sets in on the west bank of the Coosa River several miles below Gadsden and extends to the south-west to beyond the county line, Big Canoe Creek, is in the line of extension to the south-west of the Leeth Mountain. It and Leeth Mountain were boubtless once parts of the same mountain. It is just to the north-west of the Rome and Cahaba Thrust Fault or the fault that runs just to the south-east of the Leeth Mountain. This fault brings (a) Coosa (Flatwood) Shales and Limestones in contact with its Red Mountain (Clinton) strata. In some places on the south-east side of this belt, there are patches of Sub-carboniferous chert between the strata of this formation and the fault. This belt has a conglomerate along its south-east edge or along its top that has a dip of about 50 deg. to the south-east while its bottom strata have a dip of only about 20 deg. to the south-east. The outcrops of this formation are nearly ¼ mile broad in the gap through which the Gilbert ferry road passes in the N. E. corner of S. 32. T. 12, R. 6 E, and, since their dip is from 25 deg. to 30 deg. to the south-east, they must be here some 500 feet thick. They however in this gap look as if they might have some breaks or small faults in them and so there may be some duplication here. The strata in this gap are nearly all sandstones, partly massive. They have some sandy ore in their upper part. A good ore with an unctuous feel, in loose pieces, occurs over their bottom strata or along their north-western edge in the N. W. ¼ of N. E. ¼ of S. 16, T. 13, R. 6 E. Some loose pieces of good ore also occur over their upper strata or near their south-east edge in the S. W. ¼ of S. W. ¼ of S. 6, T. 13, R. 6 E. Their good ore, however, is doubtless thin, though it has never been tested.

The strata of this formation just to the north-east of the county line, Big Canoe Creek, have a broad outcrop, capping two high points of the ridge in a north-west and sout-east line and separated from each other by a deep hollow. Just to the south-west, however, along the creek or county line, these strata have a very narrow outcrop or are for the most part engulfed in the fault to the south-east of them. They are entirely engulfed in this fault for several miles just to the south-west of the creek or county line.

Colvin Mountain is capped with this formation. Its top is the county line from the line between R's 7 & 8 E. to the south-west to the Coosa River, opposite Greensport. The whole mountain to the north-east of this range line is in Calhoun county. Its belt of this formation is therefore split by the county line. The red ore of this mountain in the south-east corner of the county, near where the county line leaves the mountain, or in the N. E. ¼ of N. E. ¼ of S. 36, T. 12, R. 7 E., is reported to be about 3 feet thick. To the south-west a short distance, at the Colvin Gap, there are along the road through the gap some loose pieces of very good fossiliferous ore with the flattened grains. The dip in this gap is about 30 deg. towards the south. A great deal of good ore in *brick-like* blocks, along with boulders of a very poor ore, is scattered over the south-east slope of the mountain in the S. W. ¼ of S. E. ¼ of S. 34, T. 12, R. 7 E. The boulders are sandy and pebbly. This loose ore is believed to come from 3 different seams that are from 8 to 14 inches each in thickness. Here the outcrops of this formation are about ¾ mile broad.

Along the top of the mountain over the tunnel of the Anniston and Cincinnati Railroad in the N. W. ¼ of S. 16, T. 13, R. 7 E. and to the south-west to the point of the mountain at Davis' Gap in the S. E. ¼ of S. 17, T. 13, R. 7 E., there is a ledge of massive coarse grain sandstone that forms a high projecting bluff. This ledge of rocks is the county line. It has a dip over the tunnel of about 50 deg. to the south-east, the strike being about N. 40 deg. E. The tunnel is said to be 900 feet long. It is altogether in the rocks of this formation, which must therefore be here nearly 700 feet thick. The ledge of sandstone forming the county line along the top of the mountain where crossed by the Gadsden and Jacksonville road in the N. W. ¼ of S. 16, T. 13, R. 7 E. has a dip of about 60 deg. to the south-east. To the south-east of it and hence over it there crops out along this road some pinkish and yellowish shales to a seam of conglomorate about 3 feet thick with small rounded pebbles uniformly distributed through it.

Colvin Mountain and the strata of this formation are broken in two at Davis' Gap. At this break, they are duplicated for about 2 miles. This duplication is separated by one or more faults which run through the gap. The south-east portion of the duplication at its south-west end is partly made up of several short ridges separated from each other by faults. The portion of Colvin Mountain to the east and north-east of the gap is of somewhat the shape of a pruning knife; the curved or bent around portion, just to the east of the gap proper and the cove leading up to the gap, standing for the blade of the knife and the rest of the mountain, the straight portion of it, for the handle. The mountain across the break or to the north-west of the gap (Green Creek Mountain) starts up suddenly as a high broad mountain in which the rocks of this formation, highly developed, cover considerable surface area. In the upper part of these rocks, on the south-east side of the mountain, there are the outcrops of several ore seams near the county line soon after it crosses the gap and to the north-east and south-west of this point. There is said to be 5 of these ore seams, ranging in thickness from 1 to 3 feet. Their outcrops occur within a space of about 150 yards. The lowest down the mountain of these outcrops, the uppermost seam, forms a ledge, 14 inches thick, of hard, poor, pebbly ore. From this ledge up the mountain, there is a great deal of loose ore, in slabs from 6 to 8 inches thick, but none of the other bedded seams were seen. On top of the mountain here also is the massive coarse grain sandstone, that here too and to the south-west as a bluff forms the county line. Its bluff here, from 20 to 30 feet high, has *rock-houses* under and in it. These sandstones along the top of the mountain, just to the south-east of the bluff, the county line, make naked glady places. The dip is from 30 deg. to 50 deg. to the south-east. The strata just under this sandstone, not visible along here, being covered by a red loam, are believed to be reddish colored shales, as they are farther to the south-west.

The sandstones along the top of the mountain at the Walker Gap in the N. E. corner of S. 13, T. 13, R. 6 E. are very massive. They there form a sharp crested ridge, steep on both sides. Their strike is N. 60 deg. E. and their dip is from 60 deg. to 75 deg. to the S. S. E. Just under them there are to be seen the reddish colored shales to a thickness of some 75 feet; and in the strata just over them or to the south-east of them, there are outcrops of an ore seam that appears to be about 3 feet thick. These bluff making or county line sandstones at the Phillip's or Harrelson Gap in the N. E. ¼ of S. E. ¼ of S. 22, T. 13, R. 6 E. are very massive. They have a dip of about 25 deg. to the south-east. Just under them here also are exposed the pinkish or reddish shales to a great thickness. It can be very plainly seen at this gap that the mountain is much higher on the steep north-west side than it it on the sloping southeast side, or rather that the country just to the north-west of it is much lower than that to the southeast of it. Just to the south-west of this gap, there are said to be three ore seams, but only one of them has been seen by the writer. This one is in the upper strata of the formation; it is a good solid fossiliferous ore with flattened grains but it is only about 7 inches thick. To the south-west, at the Acker or Dodd Gap, there are loose pieces of good red ore on both sides of the mountain or the bluff of county line sandstones. These sandstones form shoals across the Coosa river just below Greensport.

(4) *Devonian (e) Black Shale.* This formation from 10 to 75 feet thick forms a line of outcrops along each of the mountains or belts of the underlying Red Mountain (Clinton) Formation, except along the Leeth Mountain and most of the ridge to the south-west of Gadsden, where it is engulfed in a fault, and in the Colvin and Green Creek mountains where it is, in many places at least, entirely or almost entirely wanting, and where, if present, it would be almost entirely outside of the county.

The outcrops along the north-west side and around the north-east end of Murphree's Valley, Bristow's Cove, have already been spoken of in the Murphree's Valley

Report, published in 1893.

The outcrops around the north-east end of Chandler Mountain and around Greasy Cove are continuous, but those on the northwest side of Wills Valley are in places partly and in other places wholly engulfed in a fault. On this side of Wills Valley, the Black Shale shows an outcrop about 30 feet thick in a gap through West Red Mountain in the N. E. ¼ of N. E. ¼ of S. 35, T. 13, R. 3 E. This outcrop is more than vertical or is bent over towards the north-west until it has a dip of about 85 deg. to the south-east. To the north-east, the formation is frequently engulfed in a fault, and where not engulfed in a fault its outcrops are either about vertical or more than vertical, being pushed over towards the north-west until the dip is to the south-east, in places less than 45 deg. to the south-east.

The outcrops on the south-east side of Wills Valley, in East Red Mountain, are continuous. They show a thickness of about 10 feet along a dry branch in the S. W. ¼ of S. E. ¼ of S. 6, T. 10, R. 7 E. and can be seen in most of the hollows and ravines down on the south-east side of the mountain in this neighborhood. Farther to the south-west, they show a thickness of from 12 to 15 feet down on the south-east side of the mountain along a branch in the N. W. ¼ of S. 26, T. 10, R. 6 E., and about 25 feet thick in a ravine in the S. E. ¼ of S. E. ¼ of S., 5, T. 11, R. 6 E. The outcrop along the road over the mountain at the Broughton Ridge Gap in the S. E. ¼ of N. E. ¼ of S. 8, T. 11, R. 5 E. is about as in the following section :

Outcropping in the S. E. ¼ of N. E. ¼ of S. 8, T. 11, R. 6 E.

[6] *Fossiliferous Chert.*	
[5] Shale; of an orange color, believed to be bottom Sub-carconiferous strata, about..................	4 ft.

[4] **Shales, Sandstones; *Devonian*, bluish shales with thin ferruginous sandstones.**
[3] ***Black shales;* from** .... **10 to 12 ft.**
[2] **Loam: red and orange colors, from** .... **2 to 3 ft.**
[1] **Red Mountain [Clinton] Formation.**

The dip of this outcrop is about 20 deg. to the south-east.

The *black shale* outcrops in Little Mountain, the ridge just to the south-east of Lookout Mountain, are continuous but do not show in many places in Etowah county. It crops out in a gap through this mountain in the southern part of S. 4, T. 11, R. 7 E., as in the following section:

Outcropping in the Southern Part of S. 4, T. 11, R. 7 E.

[4] *Fossiliferous Chert.*
[3] Limestone; in alternate seams of a blue cherty rock and of dark shaly rock, Sub-carboniferous, from .... 45 to 50 ft.
[2] *Black Shale:* from .... 15 to 20 ft.
[1] *Red Mountain [Clinton] Limestones.*

The dip of this outcrop is from 35 deg. to 45 deg. to the north-west.

The following outcropping occurs in a gap through the ridge in the N. W. ¼ of S. W. ¼ of S. 19, T. 10, R. 8 E.

Outcropping in the N. W. ¼ of S. W. ¼ of S. 19, T. 10, R, 8 E.

[6] *Fossiliferous Chert.*
[5] Debris. Clay; the clay is light colored and plastic and is in the lower part of the debris, doubtless Sub-carboniferous. from .... 10 to 12 ft.
[4] *Black Shale:* about .... 30 ft.
[3] Sandstone; *Devonian*, dark colored, very hard with balls of pyrites .... 3 ft. 6 in.
[2] Debris; about .... 40 ft.
[1] *Red Mountain [Clinton] Formation.*

The dip of this outcrop is some 70 deg. to the north-west.

The formation is engulfed in a fault for nearly the whole length of the Red Mountain (Clinton) ridge that sets in on the west bank of the Coosa River several miles below Gadsden and extends to the south-west to beyond the county line. It however shows an outcropping of unusual thickness, about 75 feet thick, on this ridge about one mile south-west of the north-east end or in the N. W. ¼ of S. 27, T. 12, R. 6 E. Its outcrop in a ravine in the N. E. ¼ of S. W. ¼ of S. 6, T. 13, R. 6 E. has been dug into for stone coal, and in another place for gold, its pyrite being taken for gold.

This formation in Colvin and Green Creek mountains, with the exception of the duplication at Davis' Gap, is not known to crop out at a single place in Etowah county or on the north-west side of the brow of the mountain, the county line. It appears to be wanting in places at least along this mountain.

(5) *Lower Sub-carboniferous*, (f) *Fort ayne Chert (Tuscumbia Limestones and Lauderdale Chert.)*—This formation from 150 to 275 feet thick covers about 15 square miles of the surface area of Etowah county. Its belts are made up of the more sloping sides of ridges and parts of narrow valleys at the foot of these ridges. These belts occur along with those of the underlying (4) Devonian and (3) Red Mountain (Clinton) formations.

The Lower Sub-carboniferous formation along the north-west side and around the north-east end of Murphree's Valley, Bristow's Cove, is well developed. It covers considerable area. It has been treated of in the Murphree's Valley Report, published in 1893, but the following additional notes may prove of some interest.

It has, for some 5 miles to the south-west of Walnut Grove, considerable manganese ore, *pyrolusite*. The north-east 2 miles of this distance is in Etowah county. The most of this manganese ore is rocky or cherty, though there is among it a great deal of good ore and from it there can be collected very fine cabinet specimens. It, especially the rocky or cherty ore, occurs principally in the lower strata, the Lauderdale Chert, of this formation, though there is much of it, mostly as a fine black smutty powder, in the upper strata, the Tuscumbia Limestones, with the fossil *lithostrotion canadense*. The hard rocky or cherty ore, along with some good ore, in the lower strata seems to be in large quantity along near the county line, as shown in several old test pits down on the north-west side of the mountain in the S. W. ¼ of N. W. ¼ of S. 22, T. 11, R. 3 E. In one of these old pits that has been filled up, the ore is said to be a little over 2 feet thick and to be almost free of rock or chert, though in another old pit, only a few feet to the north-east, it is all rocky or cherty ore with the exception of a few boulders. The dip here is 15 deg. to 20 deg. to the north-west. To the north-east a short distance, along the top of the mountain in the strata of this formation, the hard rocky or cherty ore shows to be in large quantities. It is here for the most part in irregular streaks and splotches in the hard cherty rocks.

In the upper strata of this formation, the *lithostrotion canadense* strata, in an old test pit near the north-west foot of the mountain in the S. E. ¼ of S. W. ¼ of S. 15, T. 11, R. 3 E., the manganese ore is in irregular streaks or seams that are almost at right-angle to the stratification of the rocks. In this pit, the ore is a soft, black, smutty, rather light powder, though on the surface, around the pit, there are some fine specimens of hard heavy crystalized ore. To the north-east of this pit about ¼ mile, there is an old shaft that is said to have been dug in search of silver, the manganese ore having been taken for silver ore. The ore, as soft, black, smutty powder, of rather light weight, shows in this shaft as a seam which on one side of the shaft is about 18 inches thick unmixed with rock or chert, while on the opposite side of the shaft it is about 30 inches thick and is mixed with some loose chert. The dip is 15 deg. to 20 deg. to the north-west. The ore outcrop on the side of the mountain to the south-east of the shaft makes a very black place with some small pieces of hard ore. The following sections of test pits, on the outcrops of this manganese ore, are from the field notes of the Birmingham Mineral Railroad:

Sections of Test Pits from Field Notes of the B. M. R. R.

[1] About 60 feet below the Top of Red
Mountain in the N. W. ¼ [?] of
N. E. ¼ of S. 21, T. 11, R. 3 E.

[a] Pit.

Debris.
Manganese Ore and Chert; mixed..... 30 in.
Chert.
Black Shale; *Devonian*.

[b] Pit.

About 15 feet to south-west of pit [a].
Manganiferous Iron Ore.............. 24 in.
Manganiferous Ore and Chert......... 30 in.

[c] Pit.

About 80 feet, down the hill or below pit [b].
Manganese Ore and Chert............ 24 in.

(2) *On Summit of ridge in the N. W, ¼ of N. W. ¼ of S. 22, T. 11, R. 3 E.*

Manganese Ore and Chert; mixed	12 in.

(3) *On Spur of the ridge about 300 feet East of Blountsville and Walnut Grove Road or in the N. E. 1-4 of N. W. 1-4 of S. 22, T. 11, R. 3 E.*

Maniganiferous Iron Ore, in a small pocket about 5 ft. deep x 10 ft. x 7 ft.

(4) *About 500 yards North-east of (3) or in the N. W. 1-4 of N. E. 1-4 of S. 22, T. 11, R. 3 E.*

Manganese Ore and Chert	54 in.
Manganese Ore	11 in.
Chert with *Manganese Ore*	36 in.
Manganese Ore and Chert; mixed	28 in.
Probably more *Manganese Ore.*	

The following two sections of test pits on this manganese ore are given on good authority:

Pit 1.

In the N. E. 1-4 of S. E. 1-4 of S. 21, T. 11, R. 3 E.

Surface soil.	
Manganese Ore	25 in.
Manganese Ore with calcareous chert	10 in.
Sandstone.	

Pit 2.

In the S. E. 1-4 of N. W. 1-4 of S. 22, T. 11. R. 3 E.

Flint rock with stringlets of Manganese ore	8 in.
Clay, indurated	8 in.
Manganese Ore	3 in.
Clay indurated	10 in.
Manganese ore	4 in.
Clay	14 in.
Ironstone with nodular enclosures of *Manganese*	14 in.
Clay, indurated	18 in.
Sandstone.	

This formation is continuous around the north-east end of Murphrees Valley (Bristow's Cove) but soon becomes engulfed in a fault on the south-east side of the valley.

The outcrops of this formation around the north-east end of Chandler Mountain, around Greasy Cove, and up the north-west side of Wills Valley, are continuous until the north-west side of Wills Valley, is reached when they have frequent gaps in them in which they are engulfed in a fault. There is a detached body of them on the high Red Mountain (Clinton Mountain) to the north-east of the north-east end of the Chandler Mountain. This patch has been detached from the continuous belt around the end of Chandler Mountain by erosion through its strata down into underlying strata.

On the north-west side of Wills Valley, the rocks of this formation in the S. W. ¼ of S. 4. T. 12, R. 4 E., appear to form the greater part of the mountain, but in a little ways to the north-east they form only a thin coating to the sloping north-west side of the mountain. They, from the S. E. ¼ of S. 26, T. 13, R. 4 E. to the north-east to the county line, are for the most part engulfed in a fault. The gaps in which they are engulfed in the fault are from 2 to 4 miles long while the intervening spaces in which they occur, partly at least, are from 1 to 3 miles long.

The lower rocks of this formation, especially some concretionary masses in them, in an outcrop on a knoll in the S. W. ¼ of N. W. ¼ of S. 23, T. 10, R. 5 E., smell very strongly of crude petroleum. On the north-west side of the ridge formed by these rocks and the underlying strata, there is in the S. E. ¼ of S. W. ¼ of S. 17, T. 10, R. 6 E. a high bluff of light gray limestone, that are believed to belong at the top of this formation.

A cave occurs in the lower strata of this bluff. In the lower strata of the formation near the county line or in the N. W. ¼ of N. W. ¼ of S. 9, T. 10, R. 6 E., there is said to be considerable manganese ore.

The outcrops of this formation on the south-east side of Wills Valley are continuous. They include the sloping south-east side of East Red Mountain and the north-west edge of Little Wills Valley. Their lower strata show to a great thickness along the road over the ridge at the Broughton Bridge Gap in the S. E. ¼ of N. E. ¼ of S. 8, T. 11, R. 6 E. These lower strata are hard and cherty, and are 12 inches each in thickness. Some of the lower of them, stained and orange color, become a little shaly on weathering. The dip to the south-east of the upper ones is about 10 deg. and of the lower ones about 20 deg.

The belt of this formation just to the south-east of Lookout Mountain is made up of the sloping north-west side of Little Mountain and the south-east edge of Owl Valley. Its bottom strata, in a gap in the southern part of S. 4, T. 11, R. 7 E., are a blue cherty limestone and a dark colored impure shaly limestone. These limestones show to a thickness of 45 to 50 feet. To the north-east, in an other gap in the N. W. ¼ of S. W. ¼ of S. 19, T. 20, R. 8 E., there are outcrops of a hard impure shaly limestone and of a deep blue cherty looking limestone. These limestones have a brown siliceous crust or shell about ½ inch thick that makes them look like sandstones. They show to a thickness of 30 to 40 feet and have just under them, between them and the Black Shale (Devonian), 10 to 12 feet of debris with a plastic white clay,

The detached patches on the south-east side of the Red Mountains (Clinton) ridge that sets in on the west bank of the Coosa River, several miles below Gadsden, are two or more in number. They are just to the north-west of a big strike fault (Rome and Cahaba Fault) and along this fault they are in contact with (a) *Coosa (Flatwood) Shales and Limestones*.

The outcrops of this formation in Colvin and Green Creek mountains are not known to occur in Etowah county or to the north-west of the top of the mountains, the county line, except in the lap or duplication of the mountains at Davis' Gap, though their bottom strata on some of the high points of the mountains may extend over or to the north-west of the county line.

(6) *Upper Sub-carboniferous*. This formation from 600 to 1200 feet thick covers some 20 square miles of the surface area of Etowah county. It is in belts that occur along with, those of the underlying formation, though it has no patches in this county to correspond to those of the underlying formation to the south-west of Gadsden and on Colvin and Green Creek mountains. Its belts are made up of the greater parts of high mountain sides and of adjoining narrow valleys. It is principally of the *Bangor Limestones and Hartselle Sandstones* type, though some of it is of the *Oxmoor Shales and Sandstones* type.

This formation along the north-west side and around the north-east end of Murphree's Valley (Bristow's Cove) is continuous and well developed, though on the south-east side of this valley and cove it is engulfed in a fault with the exception of a few narrew patches. Its occurrence in this valley and cove has already been considered in the Murphree's Valley Report.

Its belt around the north-east end of Chandler Mountain and down into Greasy Cove is unevenly split by the county line, the greater part of the belt being thrown outside of the county. Its lower strata are in this county. These lower strata are mainly a very massive sandstone, that corresponds to the Hartselle Sandstone. This sandstone in rounding the north-east end of Chandler Mountain forms a considerable area in this county to the north-east of Little Canoe Creek, the county line. It is in many places naked. After making the horseshoe bend around the end of the mountain, it recrosses the creek or county line and forms a ridge just to the south-east of the creek. Just under it in places, there are visible limestone outcrops.

This formation makes but a very poor showing in the belt on the north-west side of Wills Valley, as its strata are badly covered up and engulfed in a fault. Its strata have been seen in bedded outcrops in this belt in only a few places.

In the belt on the south east side of Wills Valley or that make up the greater south-east part of Little Wills Valley and most of the steep north-west side of Lookout Mountain, the strata are continous and can be seen in many fine outcrops. One of these outcrops, of bluffs of limestones along the foot of the mountain opposite Keener Station, has caves in it. This belt comprises about the whole width of Little Wills Valley for 6 to 7 miles above its south-west end or to the north-east of Attalla. Along its north-west edge or in its lower strata, there are 5 to 6 miles north-east of Attalla, outcrops of limestones with lime sinks, ponds, and big springs of hard water. and then to the south-west the sandstones are in two ledges from 60 to 70 feet apart. Some of the limestones are weathered into furrows and ridges and some of them are covered with a growth of red cedar. The upper or south-east ledge of sandstone, of flagstones from 6 to 8 inches each in thickness is about 20 feet thick. In this ledge just north-east of Attalla, there is a quarry that furnished the rock for the piers of the railroad bridge across the Coosa River at Gadsden. The lower or north-west ledge is of massive light colored, rather fine grain, compact massive sandstones that are in places known as *fire rock*, because they will stand fire and are used in the building of chimneys, especially the backs of fire places. These rocks show in the north-east edge of Attalla and in the hollows about ½ mile to the north-west and west of Attalla. In these outcrops, they are so badly broken up that they lie around as loose boulders without any regular dip or strike. Over them, between them and the fault in the south-east edge of Attalla or under Attalla, there are shales with limestones of this formation, as seen in digging wells. These shales and limestones are in contact along the fault with (a) *Coosa* (*Flatwood*) *Shales and Limestones.*

The belt of this formation just to the south-east of Lookout Mountain is principally of the Oxmoor Shales and Sandstones type. Its strata are badly covered up and hence do not show in a great many places. They however cover the greater part of the mountain (Lookout) side and of Owl Valley.

The outcrops of Oxmoor Shales and Sandstones just to the south-east of the Colvin Mountain crosses the county line over into Eltowah county, as a narrow streak, between the duplications of the mountains in the Davis Gap.

The (g) Oxmoor Shales and Sandstones form a very broken country of 10 to 15 square miles to the north of the Colvin Mountain in the south-east corner of the county. This broken country lies principally in Etowah county or to the west of Ball Play Creek, making the broken divide between that creek and Dry Creek. Its Sub carboniferous strata appear to have been pushed over from the south-east and dumped down on top of (a) Coosa (Flatwood) Shales and Limestones. The nearest body of (g) Oxmoor Shales and Sandstones, at present, is some five miles to the south-east. This broken country extends out north from the ridges of (b) Siliceous (Knox) Dolomite and Chert some 3 miles over the Cambrian strata. These Cambrian strata can be seen almost all around the broken country of Sub-carboniferous strata, and in places within it. The strata of this broken courtry or these Sub-carboniferous strata are so contorted and broken up as to have no general dip or strike. The shales on the outcrops are often of reddish brown and dove colors, though they are believed to be universally black beneath the surface, The sandstones are mostly flaggy and of yellowish, reddish, and brownish colors. Some of them look like old red overburnt bricks. They are sparingly fossiliferous with small crinoids and brachiopods. They often have shining quartz crystals over their surfaces and in streaks through them. These Sub-carboniferous shales and sandstones are not very thick, as the underlying Cambrian strata are exposed along Ball Play Creek and the low flat lands that extends out from this creek between the ridges of Sub-carboniferous strata. The Cambrian strata are of thin bedded bluish limestones with calcite streaks and of dark colored shales with quartz lenses and streaks. The shales are in places fissile enough to be very good roofing slates. It may be that some of the outcrops of roofing slates around the edges of the Sub-carboniferous strata are Sub-carboniferous. These slates have been used some to build chimneys. They are said to stand fire very well when placed with their ends towards the fire.

(7) *Carboniferous,* (1) *Coal Measures.* This formation from 200 to 2000 feet thick in this country covers about 150 square miles of the surface area of the county. About 100 square miles of it is on Raccoon Mountain, (including about 40 square miles of the upper or north-east end of Blount Mountain), and some 50 square miles on Lookout Mountain. It has been considered in the Plateau Report published in 1891 and the Blount Mountain Report published in 1893.

The Raccoon Mountain Coal Measures carry over their whole area in this county the Sub-conglomerate coal seams, These coal seams are given as 3 in number in the Blount Mountain Report, two of them being about 1 foot each in thickness. In this same report, the Blount Mountain is said to carry over its whole area in Etowah county 6 seams of coal, 2 of which are over 3 feet each in thickness, and over its south-west end in Etowah county 28 coal seams with a combined thickness of about 50 feet of coal. Six of these 28 seams are given as over 3 feet each in thickness. The coals of Raccoon Mountain as it merges into Blount Mountain are worked some.

The Lookout Mountain Coal Measures in Etowah county show the outcrops of 3 coal seams above the upper Conglomerate of Tennessee. Two of these seams, in places at least, are each 1 ft. 6 in. and over in thickness. These measures are said to carry also one sub-conglomerate coal seam about 1 ft. 6 in. thick It is probable that they carry also one or more inter-conglomerate coal seams, especially the Sewanee Seam. These Lookout Mountain coal seams have been worked some by surface diggings and, in the south-west end of the mountain, by drifts, for home consumption in Gadsden and Attalla.

The total coal output of the county for 1896 has been estimated by the State Mine Inspector at only 3,080 tons.

CHAPTER VII.

ST. CLAIR COUNTY·

The geological formations of this county are as follows:

[7]	*Carboniferous*	[i]	*Coal Measures*	500-4500 ft.
[6]	*Upper Sub-carboniferous*	[h]	*Oxmoor Shales and Sandstones (Bangor Limestons and Hartselle Sandstones)*	800-1500 ft.
[5]	*Lower Sub-carboniferous*	[g]	*Fort Payne Chert (Tuscumbia Limestone and Lauderdale Chert)*	150- 275 ft.
[4]	*Devonian*	[f]	*Black Shale*	0- 40 ft.
[3]	*Upper Silurian*	[e]	*Red Mountain (Clinton) Formation*	0- 700 ft.
[2]	*Lower Silurian*	[d]	*Pelham [Trenton] Limestones*	1000-1200 ft.
		[c]	*Siliceous [Knox] Dolomite and Chert*	2000-3000 ft.
[1]	*Cambrian*	[b]	*Coosa [Flatwood] Shales and Limestones*	300-1500 ft.
		[a]	*Montevallo [Variegated] Shales and Sandstones*	200 ft.

(1) *Cambrian.* This group, showing to a thickness of nearly 1800 feet, makes between 1-8 and 1-7 or about 85 square miles of the surface area of the county. It is in two belts that extend across the northern half or the county from north-east to south-west. The greater of these belts lies along the A. G. S. R. R., almost entirely to the south-east of this railroad or between it and the Gadsden and St. Clair Springs wagon road. It is separated for the greater part of its length from the lesser or south-east belt by a broken belt from ½ to 1 mile wide of hills and ridges of overlying formations. At the south-west end of this greater belt, however, or opposite

St. Clair Springs for some 2 miles, the two belts are in contact along the fault that bounds the lesser belt on the north-west. The greater belt is also bounded on the north-west by a fault. The strata of both of these belts, in a general way, have a north-east and south-west strike and a dip towards the south-east. They are however in wrinkles and waves which often give to the strike a serpentine course and to the dip other directions than the general one to the south-east. These belts are both of [b] *Coosa [Flatwood] Shales and Limestones* with the exception of a narrow patch of [*a*] *Montevallo [Variegated]* Shales along the fault to the north-west of the lesser or south-east belt near its south-west end. This south-east belt is entirely cut out by the fault to the south-east of the north-east end of the Cahaba Coal Field for some 6 to 8 miles to the south-west to where it sets in as a narrow belt of principally Montevallo [Variegated] Shales and Sandstones. There is also to the south-west of Springville a narrow belt of [b] Coosa [Flatwood] Shales and Limestones to the north-west of the fault along the north-west edge of the larger belt of Cambrian strata.

[a] *Montevallo(Variegated) Shales and Sandstones.* This formation is of two narrow patches along the fault [Rome and Cahaba] that bounds the Cahaba Coal Field on the south-east. One of these patches, however, is nearly 2 miles to the north-east of the coal field or is in the S. E. ¼ of S. 13, T. 15, R. 2 E., near Truss' Lower Mill. It is of a grayish yellow sandstone 7 to 8 feet thick with pinkish and greenish shales, with interstratified flaggy sandstones, both over and under it. The flaggy sandstones, of pinkish and yellowish colors, break up into cubical blocks on weathering. Shafts have been sunk into these variegated shales and sandstones, both over

and under the massive sandstone ledge, by mineral prospectors in search of precious metals. These shafts were most probably located by the *mineral rod*.

The other patch is the projection to the north-east into this county of the belt of [a] Montevallo [Variegated] Shales and Sandstone along the south-east edge of the Cahaba Coal Field. It does not project very far up into this county before it becomes engulfed in the fault. Its maximum width is not over 150 yards.

[b] *Coosa [Flatwood] Shales and Limestones.* This formation, from 300 to 1500 feet thick, as has been stated, makes almost the whole area of the Cambrian strata in St. Clair County. The larger tract narrows from a width of about 5 miles at its north-east end [Little Canoe Creek or the county line] to about one-half of this width at its south-west end near the St. Clair Springs. It thus embraces within this county between 60 and 70 square miles of territory. It shows many outcrops of bedded strata. The St. Clair Springs [Cornelia P. O.] in the northern part of the N. E. ¼ of N. W. ¼ of S. 2, T. 15, R. 2 E., are just within the edge of its flatwoods. The springs, many in number, are in the outcrops of a massive siliceous limestone that may belong at the very bottom of the overlying [c] Siliceous [Knox] Dolomite and Chert Formation. This rock is of a dark color, though on the weathered surfaces it often has an earthy look and is porus. The old Tuscaloosa road between Springville and Atalla is along the north-west edge of this tract of flatwoods. It is in places over the strata of these flatwoods and in other places over the bottom strata of the [c] Siliceous [Knox] Dolomite and Chert Formation. The St. Clair Springs and Gadsden road, by way of Ashville, is along the south-east edge of

this tract of flatwoods, though for most of the way it is over the bottom strata of the [c] Siliceous [Knox] Dolomite and Chert Formation.

The south-east tract of flatwoods, the one south-east of Ashville, is continous with the exception of across Buck's Valley to the south-east of Cedar Mountain, where for about a mile its strata are hid by a thin covering of red loam of the bottom strata of the [c] Siliceous [Knox] Dolomite and Chert Formation. The part to the north-east of the Buck's Valley widens out towards the north-east until, at the county line [Big Canoe Creek], it is about 3 miles broad. The part to the south-west of the Buck's Valley bulges out towards the north-west until it is about 2 miles broad. This south-east belt, as a whole, covers something over 20 square miles of the county area. Its strata, as a general thing, have a steep dip towards the south-east and are badly crumpled up. At its south-west end, along the big fault (Rome and Cahaba Fault) as it curves around the north-east end of the Cahaba Coal Field, there are many outcrops of its strata in contact with (3) Upper Silurian (Red Mountain, Clinton) and Sub-carboniferous rocks. These outcrops are of thin bedded limestones and of shales with calcite streaks through them. They, for the most part, stand about vertical and are badly crumpled up. Buck's Valley is rolling and topographically higher than the flatwoods either to the north-east or south-west of it and so it is the divide between the waters of the north-east and south-west parts of this south-east tract of flat-woods. In the flatwoods to the north-east of it, there are many glady places in which the strata appear to be about vertical and there are some few low ridges and knolls that are covered with angular sandy gravels. These gravels may be from the weathering of impure calcareous strata of the flatwoods. Along the south-east edge of this tract in places and hence at the top of the formation in places, there is a thick bed of shales that is nothing more than the weathered outcrops of thin bedded argillaceous limestones. This tract of flatwoods where crossed by the Ashville and Montevallo road is about 1 and ½ miles wide and is principally of shales with some interstratified seams of hard clayey looking dull yellowish thin bedded limestones with calcite streaks. These outcrops are in many places badly crumpled up, though their general dip appears to be from 70 deg. to almost 90 deg. towards the south-east.

The third and smallest tract of flatwood strata extend, as a narrow belt, along the A. G. S. R. R. or just north-west of a big fault (Gadsden and Shades Valley Fault) from about one mile north-east of Springville to the south-west to perhaps the county line. Its strata show in only a few places. They are in wrinkles and waves with a north-east and south-west trend, though they have a general dip towards the north-west.

(2) *Lower Silurian.* This group, from 3000 to 4000 feet thick, forms considerably over ¼ or about 175 square miles of the surface area of the county. It is of the two formations, (d) *Pelham (Trenton) Limestones* and (c) *Siliceous (Knox) Dolimite and Chert.* These formations occur both to the north-west and south-east of the Coosa Coal Field that extends through the county from north-east to south-west.

(c) *Siliceous (Knox) Dolomite and Chert.* This formation, from 2000 to 3000 feet thick, covers over 1-5 or about 140 square miles of the surface area of the county. It, in a general way, forms broad broken belts of country with a north-east and south-west trend. Its outcrops to the north-west of the Coosa Coal Field form a belt along just to the south-east of Blount and Chandler mountains, one around the north-east end of the Cahaba Coal Field, one along the St. Clair Springs and Gadsden road, principally to the south-east of that road or between the two larger tracts of flatwoods, and one along to the north-west of the Coosa Coal Field.

The belt along just to the south-east of the Blount and Chandler mountains is usually quite narrow, being for its whole length to the north-east of Springville more or less engulfed in a fault [Gadsden and Shades Valley Fault], or perhaps faults, as there is, in places at least, a fault just to the north-west of it, as well as one just to the south-east of it. It is completely engulfed in a fault for about two miles opposite Steele Station. This belt however to the south-west of Springville broadens out into a wide tract that in about 2 and ½ miles from Springville forks, one prong going down on each side of the broad synclinal mountain between the Clayton and Massie coves. Both of these prongs have in their top strata some massive sandstone breccia with angular chert pebbles. The north-west prong is at first narrow, being partly engulfed in an underthrust fault just to the south-east of it, but it soon broadens out as it extends down into Clayton's Cove. Its strata along the fault are about vertical and badly broken up. In places they are in contact with Red Mountain [Clinton] strata of the broad synclinal mountain to the south-east. Along the top of the anticlinal just to the north-west of the narrow portion and to the north-east for some distance, the rocks of this formation have been washed down to or exposed along a very narrow belt about 2 miles long that is completely surrounded by limestones of the overlying formation. Where the anticlinal is cut across by a branch in the S. W. ¼ of S. 3, T. 15, R. 1 E., the rocks of this formation are exposed to a thickness of some 70 feet. They, with the exception of a few feet of chert at the top, are of a breccia or fine grain orange sandstone with small angular cherty pebbles in seams. They form a symmetrical arch with a dip of about 20 deg. on each side. Farther to the north-east, the strata of this anticlinal are seen in waves and wrinkles with trends both to the north-east and south-west and to the north-west and south-east. This anticlinal is crossed diagonally by the fault from its south-east to its north-west side and along the north-west edge of the fault after it crosses to the north-west of the anticlinal or in the S. W. ¼ of S. E. ¼ of S. 34, T. 14, R. 1 E., there is a short ridge some 75 feet high with along its top a bluff of the massive breccia that belongs at the top of this formation. These breccia have a dip of from 25 deg. to 30 deg to the north-west, though they are somewhat flattened along the top of the ridge. They appear to overlie Pelham (Trenton) Limestones that make a big show in the hollow just to the south-east of them. This however is due to the fault being an underthrust fault. The limestones are broken up along the fault. To the south-east of these limestones or along the south-east edge of the top of the anticlinal in the N. E. ¼ of N. E. ¼ of S. 3, T. 15, R. 1 E., there are some very large boulders of the breccia at the top of this formation. They are a coarse grain cherty looking rock with angular pebbles of Knox Chert. They do not appear to have any regular dip. These breccia show to a great thickness down in Massie's Cove on the south-east side of the synclinal mountain.

Of the big springs of hard water that occur along the edges of this formation, one is to be seen in its top strata in the N. E. ¼ of N. W. ¼ of S. 35, T. 14, R. 1 E., and one in its bottom strata in the N. E. ¼ of S. E. ¼ of S. 1, T. 15, R. 1 E. The half dozen beautiful springs at Springville rise in its bottom strata. These springs give rise to a large stream of sparkling clear water, that, though limy, is not hard enough to be disagreeable to the taste and to be unfit for the wash tub or boiler. From some of these springs, there escapes at intervals a few bubbles of natural gas.

This belt to the north-east of Springville is narrow, its strata being partly engulfed in a fault. Opposite Steel Station its strata are wholly engulfed in the fault. In places, at least, it is between faults, and by a shearing off process in the north-west fault its strata on the north-west edge are brought into contact with those of much later formation, as with the Devonian (Black Shale) strata at Cobb's Mill in the S. W. ¼ of N. W. ¼ of S. 3, T. 13, R. 4 E. Its strata here are badly broken up. Its upper ones or those next to the Black Shale (Devonian), are bent over towards the north-west until they are more than vertical or have a dip to the south-east. They are here comparatively thin, as they are partly engulfed in both of the faults. To the north-east, opposite Steel Station, where they are completely engulfed in a fault for some 2 miles, the (b) Coosa (Flatwood) Shales and Limestones are in contact with strata of the (e) Red Mountain (Clinton) formation. From near where they set in again to the north-east, four samples of their cherty strata were taken and on analysis, after being dried at 100 deg. C., gave from about 91% to 98% of silica, from 0 to about 2% of both iron and alumina, and from about 0. 2% to 0. 5% of magnesia.

The belt or tract of this formation at the north-east end of the Cahaba Coal Field is prevented by faults from extending down the north-west and south-east sides of this coal field. This tract between Springville and the St. Clair Springs is quite broad, extending almost up to the foot of the Red Mountain (Clinton) ridge on the south-west. The St. Clair Springs (Cornelia P. O.) is on the edge of this tract. The massive siliceous limestone from which the springs flow is just over the thin bedded limestones of the flatwoods. It is of a dark color, though on the weathered surfaces it often has an earthy look and is porus. It must carry pyrites in order to give rise to the sulphur springs. The springs occur in a semi-circle around the foot of a knoll. It is said that 25 to 30 of them could be gotten here. Their waters are not very strongly impregnated with sulphuretted hydrogen, though the gas is constantly escaping from some of them. They have dark, yellowish, and pinkish deposits. Along with these springs of sulphur water there are others of chalybeate and limy waters.

A massive siliceous limestone, that is sometimes slightly variegated or striped with different colored seams and with calcite streaks, occurs just over the limestone from which the above springs flow. It is a hard compact fine grain rock that will take a very good polish and so might answer very well for a marble. Just over this rock, there is loose Knox Chert at the foot of the ridge. This is partly oolitic and along with it are some few loose peices of a fine grain breccia. In it, there are some lime sinks and big springs.

The belt of this formation along the St. Clair Springs and Gadsden wagon road, principally to the south-east of this road, or between the two larger tracts of flatwoods, is not continuous. It is cut in two and engulfed about 3 miles south-west of Ashville and also just south-west of Big Canoe Creek, the county line on the north-east, by large bends towards the north-west in the fault (Rome and Cahaba Fault) along the north-west edge of the south-east tract of flatwoods. This belt as a ridge suddenly stops on the south-west on the east bank of Little Canoe Creek in the N. W. ¼ of S. 6 T. 15, R. 3 E., though its bottom strata cross to the south-west of this creek. It is stopped here by the above fault along the north-west edge of the south-east tract of flatwoods in one of its great bends towards the north-west. Between this belt and the above fault in its great bends towards the south-east, there are overlying strata as high up as the Sub-carboniferous. Along the north-west edge of the belt, there are many outcrops, often in bluffs, of the massive siliceous limestones and dolomites at the bottom of this formation. These rocks form rolling lands of red sandy loam and have in their outcrops numerous lime sinks and some springs. Several of the springs at Sq. B. F. Ash's in S. E. ¼ of S. 7, T. 14, R. 4 E. are of chalybeate water with an oily scum over its surface.

The belt of this formation along to the north-west and parallel to the north-west edge of the Coosa Coal Field is from 1 to 2 miles broad and extends clear through the county from north-east to south-west. It forms a broken country with many high ridges and hills. In a general way, it is highest along its north-west edge and slopes from near this edge towards the south-east. Its highest ridges in the north-east part of the county are known as "Hinds Mountain" and also as the "Piney Ridge." Its strata at the north-east end of the Cahaba Coal Field are in contact with the Coal Measures of this field, being of course separated from them by a big fault. To the south-west of this point of contact, they are separated from the strata of the coal field by a narrow valley, less than 200 yards wide,of Cambrain strata, principally vertical [a] Montevallo [Variegated] Shales and Sandstones.

This belt appears to bulge out some towards the north-west opposite "Bucks Valley" until its lower strata, making the rolling red lands of this narrow valley, form a water divide across the valley between the flatwoods to the north-east and south-west. Over the upper strata of this belt or over the cherty ridges along near its south-east edge in the S's 35, 25, & 26, T.14, R. 3 E., there are some considerable deposits of limonite. The lower strata of this formation in outcrops along the north-west edge of the belt in the S. W. ¼ of S. W ¼ of S. 19, T. 14, R. 4 E. are so siliceous as to look like sandstones on the weathered outcrops. These rocks show as loose boulders over the hill sides. This belt is said to have a very extensive deposit of fine white porcelain clay some three miles west of Greensport. At the top of this formation in the Montevallo road between ¼ and ½ mile west of Greensport, there is an outcrop of *baryte* or *heavy spar* in a seam from 8 to 10 inches thick. This mineral occurs at other places in the belt. It is said to carry specks of *galena*.

The outcrops of this formation to the south-east of the Coosa Coal Field in St. Clair county are all in one connected body in the south-east part of the county, next to the Coosa River, the county line. They are of the north-west edge of a very large body of these rocks that lies principally across or to the east of the river. The portion in this county is from 4 to 10 miles broad and some twenty miles long. It is for the most part of the lower strata of the formation or of the siliceous limestones and dolomites that on weathering give rise to a fertile red sandy loam. The lands of this loam are principally next to the river. They form most of the farming lands of the Coosa Valley proper. The upper or more cherty strata of the formation, forming a broken country, crop out principally away from the river or along the north-west edge of the country of these rocks, This tract of country is bounded on the north-west by a big thrust fault that brings its strata in contact with (h) Oxmoor Shales and Sandstones. At its north-east end or a short distance south of Broken Arrow Creek, a large body of its strata have been pushed over and dumped down on the Sub-carboniferous strata. This pushed over body is separated from the main body to the south-east by a narrow strip of Sub-carboniferous strata along the fault. It is of somewhat the shape of a hand, with its south-west end corresponding to the rist. It is nearly 5 miles in length from north-east to south-west and between 1 and 2 miles broad from north-west to south-east. It gradually rises from the south-west to its north-east end. The north-east end is of several high points that overlook towards the north-east a comparatively low flat country of the Sub-carboniferous strata. These high points are known as "Hog Mountain," "Still House Mountain," and "Blue Point Mountain." They are separated from each other by short, narrow, deep, finger pointed coves in which the underlying Sub-carboniferous strata are exposed. On the tops of these mountains, there are some rows of large boulders of Knox Chert.

Just south-east of the big fault or along the north-west edge of the main body of these rocks, there are, in S. 15, T. 16, R. 4. E., some coarse cherty breccia with large angular cherty fragments. From this elevated north-west edge to the south-east to the Coosa River, there is a broken piney woods country of a light gray siliceous soil. The pine is of the long leaf variety and is fine timber.

Some good limonite, associated in places with large ferruginous cherty boulders, occurs scattered over the hills around Seddon on the G. P. R. R. There is seemingly quite a large deposit of this ore of good quality, though almost exclusively pebbly ore, to the west of Seddon or along the north-west edge of these rocks in the S. E. ¼ of S. W. ¼ of S. 31. T. 16, R. 4 E. To the south-west of this deposit, or in S. E. ¼ of S. W. ¼ of S. 11. T. 17, R. 3 E., there are other deposits of this ore, though seemingly not so large. The country for some 2 miles to the south-east of here is especially broken, being made up of cherty hills and ridges. Still farther to the south-east, on to the Coosa River, are the rolling red lands of the Coosa Valley proper. In these red lands, there are many large loose boulders of Knox Chert and many lime sinks. They also have occasional deposits of limonite, though seemingly quite small. Several of these limonite deposits are to be found in S. 10, T. 18, R. 3 E. The ore of one of them is in large boulders while that of an other is in small boulders, nodules, and gravels. In both of these deposits, however, the ore is of very good quality, though badly mixed with cherty rocks. Nodular and gravelly limonite forms a thick covering over a low knoll of an acre or more in extent near the north-west edge of the rocks of this formation in the northern part of S. 5, T. 18, R. 3 E.

(d) *Pelham (Trenton) Limestones.* These rocks 1000 to 1200 feet thick form less than 1-10 or not over 45 square miles of the surface area of the country. Their outcrops are most often covered up and are sometimes engulfed in faults by a shearing off process where the overlying and underlying strata have been left unfaulted. This must be because they are of a softer nature than the overlying and underlying strata.

The outcrops to the north-west of the Coosa Coal Field are of a belt along to the south-east of the Blount Mountain, one to the north-east of the Cahaba Coal Field, one on the steep north-west sides of Canoe Creek and Cedar mountains, respectively to the north-east and south-west of Ashville, and one along near and parallel to the north-west edge of the Coosa Coal Field or just to the north-west of the Beaver Creek Mountain (Little Oak Mountain, as it is sometimes called.)

The belt along to the south-east of Blount Mountain to the north-east of Springfield is more or less engulfed in a fault. No outcrops have been seen in this portion of it, except at the head of Greasy Cove. They probably occur in other places, while in still other places the belt is known to be completely engulfed in a fault. This belt however to the south-west of Springville shows all along a great thickness of strata. It forms high spurs that extends out towards the south-east from the Red Mountain [Clinton] ridge near the county line on the south-west. Its outcrops here are in waves with a north-east and south-west tread. They are bluffy and are covered with a growth of red cedar. They form rocky cedar glades over the top of the anticlinal in the S ½ of S. 3. T. 15, R. 1 E. Some of their lower strata here have in them angular cherty pebbles of greenish and black colors, They have in them also calcite streaks and some of them on weathering have a clayey look. They make in the S. W. ¼ of S. E. ¼ of S. 34, T. 14, R. 1 E. a high cone-like mountain, called "Bear Mountain." At the foot of this mountain, there are outcrops of the strata at the bottom of the formation with the angular cherty fragments of greenish and black colors.

Some of these outcrops are full of green splotches, some of them are coarse grained and granular, some have calcite streaks, some have clayey streaks and splotches, and some carry cherty nodules. There is a large body of these limestones in a hollow just ESE. of the above mountain that appear to run under a ridge of breccia of the [c] Silliceous [Knox] Dolomite and Chert formation. This however is a deception and is due to their being just to the south-east of an underthrust fault. They are badly broken up for some 50 feet from this fault or from the foot of the breccia ridge. They are covered with a growth of red cedar.

The limestones of this formation show to a greet thickness in the N.. W ¼ of S. 35, and N. E. ¼ of S. 25, T. 14 R. 1 E. They have not been seen any farther to the north-east in this belt until the head of Greasy Cove is reached, though they doubtless do occur in places, at least, as in the N. E. ¼ of S. 18, and N. W. ¼ of S. 17, T. 13, R. 4 E., where there is a valley about 125 yards broad along where their outcrops should be. Their outcrops in making the bend around the head of Greasy Cove are from ¼ to ½ mile broad and in places form cedar knolls.

The belt just to the north-east of the north-east end of the Cahaba Coal Field should be continuous between the big strike fault that runs along just to the north-west of this field and the one along its south-east edge, which would give it a length of between 4 and 5 miles. Its strata however have not been seen in a single outcrop. Its position here in places is occupied by a narrow shallow valley and in other places by a high broken country that is covered with debris from the [e] Red Mountain [Clinton] formation. This belt would continue down both the south-east and north-west sides of the Cahaba Coal

Field were it not engulfed in the above big faults. To the north-west of this coal field, it however sets in near the head of Massey's Cove, on the north-west side, and continues to the north-east along the south-east edge and around the north-east end of the broad synclinal mountain between the Massey and Clayton coves that extend several miles up into this county. Its strata are perfectly regular along the south-east edge and around the north-east end of the synclinal mountain, but on the north-west side of this mountain they are for some distance engulfed in a fault.

The outcrops of this formation on the steep north-west side of Canoe Creek Mountain show finely in places, in other places they do not show at all. They however are doubtless continuous for about 5 miles. To the north-east of this mountain, the formation is engulfed in a fault to within about a mile of Big Canoe Creek or the county line, where it sets in again and continues on to the north-east to the Coosa River a few miles below Gadsden. To the south-west of Canoe Creek Mountain, this formation is engulfed in a fault for over 5 miles or until Cedar Mountain is reached. It makes a fine showing on the steep north-west side of Cedar Mountain, near its top, in the S. ½ of S. 32, T. 14, R. 2 E. In the lower part of this outcropping, there is a great deal of variegated argillaceous limestones or streaked "calico rocks."

The belt along to the north-west of the Coosa Coal Field is from ¼ to ¾ of a mile broad and extends through the county from north-east to south-west. It makes Beaver Creek Valley and more or less of the steep north-west side of Beaver Creek Mountain. It shows many bedded outcrops. Leeds, just to the south-west of the county, and Moody's X Roads, are built over outcrops of this belt. At the top of this belt, in several places in the south-west part of the county, there were seen o[illegible]crops of a dark bluish massive limestone that on wea[illegible]ering crumbles or scales off. An outcrop near the ce[illegible]ter of the valley of these rocks south-east of Branchvi[illegible] has parallel *striæ* running across it and has its surfa[illegible] indented with pits like those made by rain drops in so[illegible] mud. The surface around this outcrop is covered wi[illegible] ferruginous gravels. In the south-east edge of this va[illegible]ley in the N. E. ¼ of S. E. ¼ of S. 36, T. 15, R. 2 E. there is a reported thin seam of baryte. The upper limestones of this belt at the mouth of Beaver Creek or on the west bank of the Coosa River just below Greensport, were quarried and used in the building of Locks 1 and 2, lower down the river. The outcrop here shows to a thickness of about 200 feet.

This formation in St. Clair county to the south-east of the Coosa Coal Field helps to make two belts of country, each from 1 to 2 miles broad, that have a north-east and south-west direction and are separated from each other by from 1 to 2 miles of [h] Oxmoor Shales and Sandstones. The north-western of these two belts is along just to the south-east of the Coosa Coal Field and the south-eastern one is along just to the north-west of the broken country of (c) Siliceous [Knox] Dolomite and Chert. They are made up of narrow strips of this formation and of the overlying sub-carboniferous strata, [g] Fort Payne Chert [Tuscumbia Limestone and Lauderdale Chert] and [h] Oxmoor Shales and Sandstones, and in places, at least, of a few feet of the [c] Red Mountain [Clinton] formation. In the north-west belt, the narrow strips are merely duplicated but in the south-east one they are repeated as many as four times. This duplication and repetition is due to strike faults. The dip is all to the south-east and as the narrow strips of this formation are always just to the south-east of the faults, they must be of the oldest or lowest strata of the 2 belts. They are also the first to disappear as the faults die out or as the vertical displacements along the faults diminish. They are just to the north-west of sharp crested ridges of [g] Fort Payne Chert. They are made up of narrow valleys along the north-west foot of the ridges, between the ridges and the faults, and of the greater parts of the steep north-west sides of the ridges.

This formation in the north-west belt is of two narrow strips that extend from near the county line on the north-east for some 6 to 7 miles to the south-west to where the south-east one gives out. The north-west one continues on for some 8 to 9 miles farther to the south-west, to over a mile to the south-west of old Broken Arrow. It is then cut out by Sub-carboniferous strata, though it may start up again, after a short gap in it, and continue on to the south-west to within about a mile of Eden, on the G. P. R. R., as the ridge of [g] Fort Payne Chert just the south-east of it is continuous to the south-west to this point. From the gap in it or from near old Broken Arrow, this strip gradually bears off from the edge of the coal field and there comes in to the north-west of it, between it and the Coal Measures, a ridge of Sub-carboniferous strata with to the north-west, along the edge of the Coal Measures, a narrow valley that is of most probably the strata of this formation, though none of these strata have been recognized in it. This narrow valley extends to the south-west to within 2 or 3 miles of the county line.

The two strips of the north-west belt at their north-east end, or from about Singleton on the E. & W. R. R. to the river, are in contact or make one broad strip with a fault down its center. The south-east strip has a fine showing of its limestones on the north-west side of the [g] For Payne Chert ridge in the north-east corner of S. 11, T. 15, R. 5 E. These limestones have dirty yellowish spotches over their sufaces and carry nodules of chert. The most south-west visible outcrops of this south-east strip are at the mouth of Trout Creek. This outcrop shows a thickess of nearly 100 feet. The north-west strip shows many outcrops of its strata. Its uper strata are well exposed in a quarry in the S.E. ¼ of N. E. ¼ of S. 26, T. 15, R. 4 E. This quarry is on the south-east side of the point of the ridge on the south-west side of a gap and is not over 50 yards from the bank of the river. The following strata are exposed in it:

Outcropping in the Quarry in the S. E. ¼ of N. E. ¼ of S. 26, T. 15, R. 4 E.

[3] Limestone; impure, becoming friable and breaking up into small angular pieces on weathering, of a dark brown color, a ledge, about	2 ft.
[2] Limestone; most likely cherty, forming a stratum about	2 ft.
[1] Limestone; a massive ledge about	15 ft.

In the limestone [1], there are water seams along which there are rough excrescences of concentric calcite layers enclosing nuclei of white or yellowish siliceous powder. In some of the limestones of this quarry, there are interstratified layers with clayey looking seams and splotches, and in some of them there are some streaks of calcite running at great angles to the planes of stratification. The rocks of this quarry were used in building the locks along the river. The outcropping here is pushed over towards the north-west until the dip along the top of the ridge is only about 30 deg. to the south-east while along the south-east foot of the ridge it is about 45 deg to the south-east.

A short distance to the south-west of this quarry, there is high up on the south-east side of the ridge an old lime kiln that was dug in the ridge. The limestone that was burnt in this kiln doubtless came from the outcropping at the above quarrry. In the south-west end of this ridge or in the point of the ridge on the north-east side of the gap where cut through by Broken Arrow Creek in the N. E. ¼ of N. W. ¼ of S. 4, T. 16, R. 4 E., there is an other quarry in the upper of these limestones. The rocks from this quarry were used in building the piers for the G. P. R. R. bridge over the Coosa River at Riverside.

The outcrops in the bed and banks of broken Arrow Creek in the N. E. ¼ of N. E. ¼ of S. 5, T. 16, R. 4 E., carry cherty seams and calcite streaks and are in waves with a north-west and south-east trend. The most southwest outcrop that has been seen in this strip is just to the south-east of old Broken Arrow, though it may extend on to the south-west to within a mile of Eden.

The narrow valley that sets in along the edge of the Coal Measures several miles below old Broken Arrow is doubtless, partly at least, in the outcrops of this formation. Its growth indicates a limy soil. Near its southwest end, in a gap through the [g] Fort Payne Chert ridge just to the south-east of it in the S. E. ¼ of S. E. ¼ of S. 24, T. 17, R. 2 E., there is an outcrop about 3 feet thick of a dark gray limestone with interstratified clayey looking seams and with calcite streaks. It looks very much like it is of this formation though it is over about 20 feet of bluish chert in flags from 4 to 6 inches thick that appears to be of the [g] Fort Payne Chert formation. It is just under [g] Fort Payne Chert.

The south-east of the two belts with rock of this formation to the south-east of the Coosa Coal Field has only one narrow strip of these rocks until within a few miles of Kelley's Creek, the county line on the south-west, when it strips of these rocks are increased to two or three. The single strip sets in on the north-east on the south side of Broken Arrow Creek or in the S. E. ¼ of S. E. ¼ of S. 9, T. 16, R. 4 E. and continues to the south-west to near the G. P. R. R. where it is displaced by [h] Oxmoor Shales and Sandstones to the north-west of a fault or is engulfed in a fault. It may be however that it soon sets in again and is then almost continuous on to the south-west to the county line, as a ridge of [g] Fort Payne Chert just to the south-east of it is continuous with the exception of one short gap. It may be that at the north-east end of the belt, there is a short secondary strip of this formation to the north-west of a short low secondary ridge of [g] Fort Payne Chert that starts in on the west band of the Coosa River at the lower end of the Broken Arrow Shoals and extends to the south-west for nearly 2 miles, though such is not believed to be the case. The south-east belt, however, does not show a great many outcrops of this formation, except near Kelley's Creek, the county line on the south-west, where there are seemingly 3 strips of this formation.

[3] *Upper Silurian, Red Mountain [Clinton] Formation.* These rocks from 0 to 700 feet thick occur both to the north-west and south-east of the Coosa Coal Field.

The outcrops to the north-west of the Coosa Coal Field are of a strip along just to the south-east of the Blount and Chandler mountains, a broad strip covering the top of the flat synclinal mountain between the Clayton and Massey coves, one along the north-west side of and around the north-east end of the Cahaba Coal Field, one along the tops of Canoe Creek and Cedar mountains respectively to the north-east and south-west of Ashville, and one along parallel to the north-west edge of the Coosa Coal Field, forming parts of the steep north-west side and top of Beaver Creek Mountain. The strips conjointly, have a surface area of less than 20 square miles.

The strip along just to the south-east of Blount and Chandler Mountains. This strip is continuous with the exception of a short distance, about 1 mile, to the south-west of Steele Station, where it is engulfed in a fault. In its upper strata near the county line on the south-west or just to the north of Mr. James B. Robinston's, in the S. W. corner of S. 33, T, 14, R. 1 E., there is an outcrop of a sandy ore seam that appears to be about 2 feet thick, though it is said to be 2 feet 10 inches thick The dip is from 10 deg. to 15 deg. to the north-west. In this same *forty*, in the gap through the Red Mountain (Clinton Ridge] to the south-east, there is the following outcropping:

Outcropping in the S. W. 1-4 of S. W. 1-4 of S. 33, T. 14, R. 1 E.

[6]	Sandstones, Shales.	
[5]	*Ore*; about	3 ft. 0 in
[4]	Clinton Strata; some	50 ft. 0 in.
[3]	*Ore*; soft	2 ft. 4 in.
[2]	*Ore*. Shale; principally a hard ore with the shale in streaks	2 ft. 4 in
[1]	Clinton Strata.	

In this gap, the strata show that they are in waves with a north-west and south-east trend. They however have a general dip to the north-west of from 20 deg. to 30 deg. To the north-east of here for some 2 miles, the Red Mountain (Clinton) ridge has so many gaps in it as to be a mere succession of high cone like hills or mountains. Along the road at the McClendon Mill dam in one narrow strip of these rocks until within a few mil of Kelley's Creek, the county line on the south-wes, when it strips of these rocks are increased to two o three. The single strip sets in on the north-east on th south side of Broken Arrow Creek or in the S. E. ¼ of S. E. ¼ of S. 9, T. 16, R. 4 E. and continues to the south-west to near the G. P. R. R. where it is displaced by [h] Oxmoor Shales and Sandstones to the north-west of a fault or is engulfed in a fault. It may be however that it soon sets in again and is then almost continuous on to the south-west to the county line, as a ridge of [g] Fort Payne Chert just to the south-east of it is continuous with the exception of one short gap. It may be that at the north-east end of the belt, there is a short secondary strip of this formation to the north-west of a short low secondary ridge of [g] Fort Payne Chert that starts in on the west band of the Coosa River at the lower end of the Broken Arrow Shoals and extends to the south-west for nearly 2 miles, though such is not believed to be the case. The south-east belt, however, does not show a great many outcrops of this formation, except near Kelley's Creek, the county line on the south-west, where there are seemingly 3 strips of this formation.

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Outcropping in the S. W. 1-4 of S. W. 1-4 of S. 33, T. 14, R. 1 E.

[6]	Sandstones, Shales.	
[5]	*Ore*; about	3 ft. 0 in.
[4]	Clinton Strata; some	50 ft. 0 in.
[3]	*Ore*; soft	2 ft. 4 in.
[2]	*Ore*, Shale; principally a hard ore with the shale in streaks	2 ft. 4 in.
[1]	Clinton Strata.	

In this gap, the strata show that they are in waves with a north-west and south-east trend. They however have a general dip to the north-west of from 20 deg. to 30 deg. To the north-east of here for some 2 miles, the Red Mountain (Clinton) ridge has so many gaps in it as to be a mere succession of high cone like hills or mountains. Along the road at the McClendon Mill dam in the N. W. corner of the N. E. ¼ of S. 25, T. 14, R. 1 E. there is the following outcropping:

Outcropping in the N. W. Corner of N. E. 1-4 of S. 25, T. 14, R 1 E.

[13]	Shales, Sandstones; the sandstones are flaggy.	
[12]	*Ore;* very hard with a metallic apearance	4 in.
[11]	Shales; yellowish	3 to 4 in.
[10]	*Ore;* good, solid, about	3 ft. 6 in.
[9]	*Ore;* soft, a little clayey from perhaps shaly streaks near its bottom	1 ft. 0 in.
[8]	Debris; about	4 ft. 0 in.
[7]	Sandstone; highly ferruginous, of a dark color	4 ft. 0 in.
[6]	Sandstones; massive, from	8 to 10 ft. 0 in.
[5]	Debris; for about	75 ft. 0 in.
[4]	Sandstones; massive	
[3]	Debris.	
[2]	Sandstone; massive.	
[1]	*Pelham (Trenton) Limestones.*	

The dip of (9) is about 25 deg. to the north-west. To the north-east or east of this outcropping for several miles, to the old ore diggings some 2 miles north-east of Springville, there is loose ore scattered over the top of the ridge or mountain, but no pits had been dug into its outcrops when gone over in October 1887, and no outcrops were found in which the thicknes of its ore seam or seams could be seen. At the above old ore diggings, in the S. E. ¼ of N. E. ¼ of S. 29, T. 14, R. 2 E., there is a small gap in the mountain and in this gap the strata of the top of the mountain can be seen to be flattened in a wave until they have a dip of only about 20 deg. to the north-west. This dip is less than the north-west slope of the mountain and so an ore seam that occurs here crops out on both the north-west and south-east of the top of the mountain. It has of course two outcrops on the north-west side of the mountain. Its two outcrops on the north-west side of the mountain are close together and have been seen only here at this gap. The upper one is some 75 yards down from the top of the mountain, while the outcrop on the south-east side is near the top of the mountain. The ore outcrop on the south-east side is pushed over towards the north-west until its dip towards tne north-west is much greater than that of the average dip in the gap, of 20 deg. to the north-west. The ore seam in the gap shows as a solid legde of ore about 20 inches thick with from 6 to 8 inches of soft shaley ore immediately over and under it, thus giving to the ore a thickness of from 32 to 36 inches. The outcrop on the south-east side of the mountain had been surface dug in Oct. 1887 until the cover was about 15 feet thick. In the north-east end of these old surface diggings, the ore seam is bent or curved over until the general dip of about 20 deg. to the north-west becomes one of from 35 deg. to 40 deg. to the south-east. After taking the south-east dip to south-east of the top of the mountain, the ore can be seen to be in waves or wrinkles with a north-east and south-west trend, a trend in the direction of the mountain. This general south-east dip causes the ore seam to strike a spur some distance down on the south-east side of the mountain. It suddenly stops or crops out by having its dip suddenly changed back to a north-west dip or as it proceeds to climb a wave. In a spur on the south-east side of the mountain, the ore is from 28 to 30 inches thick, its bottom 6 inches being soft and clayey. The cover here to this seam of ore is a yellowish shale with interstratified seams of flaggy sandstones.

To the north-east or east, about in the S. E. ¼ of N. E. ¼ of S. 28, and S. W. ¼ of N. W. ¼ of S. 27, T. 14, R. 2 E., there are some extensive surface diggings about ¼ mile long on the outcrop of this seam of ore. These diggings are down on the south-east side of the mountain, though they are not very far from the top. They were dug into until the cover over the ore seam was about 20 feet thick. The mountain here is tall and is capped with the rocks of this formation. In the western end of these old diggings, in the S. E. ¼ of N. E. ¼ of S. 28, T. 14, R. 2 E., there is about the following outcropping:

Outcropping in the S. E. ¼ of N. E. ¼ of S. 28, T. 14, R. 2 E.

[7]	Shale; of a yellowish color.	
[6]	*Ore;* soft, of an ochreous yellow color, from	4 to 6 in.
[5]	Shale	1 ft. 4 in.
[4]	*Ore,* shale; from	6 to 8 in.
[3]	Sandstones, shales; sometimes one and sometimes the other, when a sandstone there is no plane of stratification between it and the underlying ore, the one gradually passing into the other, about	4 in.
[2]	*Ore;* hard and compact, visible to a thickness of about	3 ft. 0 in.
[1]	Debris.	

The ore (2) is believed to be about 4 feet thick. The dip here is only about 15 deg. to the north-west. The smallness of this dip is most probably due to a flattening of the strata along the top of the ridge. Farther to the east in these old diggings, there is about the following outcropping:

Outcropping in the S. W. ¼ of N. W. ¼ of S. 27, T. 24, R. 2 E.

[5]	Shale; yellowish, with some compact flaggy seams.	
[4]	*Ore*	6 in
[3]	Shale	10 in.
[2]	*Ore;* doubtless from 3 to 4 feet thick, though visible to only	4 in
[1]	Debris.	

The ore (4) is very variable. A little farther still to the north-east the ore shows to a thickness of about 30 inches. It is here on the outcrop almost level, though, within 10 or 12 feet from the outcrop, it suddenly bends to a steep north-west dip. The mountain is here very steep on the south-east side and has in it a higher and thinner seam of ore.

To the north-east, in the N. W. ¼ of N. E ¼ of S. 27, T. 14, R. 2 E., there are other extensive old surface diggings. Near the north-east end of these old diggings, the ore is about 3 feet thick, though it is a little sandy. This ore is made up of small flattened rounded oolitic grains. Its fossils are almost obliterated in the well leached ore, often showing merely as yellowish splotches. Average samples of the well leached ore, full thickness of the seam, on being dried at 100 deg. C., gave the following analyses:

	(1)	(2)
Ferric Oxide	71.460	69.018
Silicia	19.754	20.553
Phosphoric Acid	0.384	0.275

[1] A well leached ore from the mouth of an old drift about 4 and ¾ miles north-east of Springville. Analyst:—J. L. Beeson.

[2] A well leached ore from outcrop about 5 miles north-east of Springville. Analyst:—J. L. Beeson.

In the gap of the mountain at Goodwin's Mill on Big Canoe Creek in the S. W. ¼ of N. E. ¼ of S. 13, T. 14, R. 2 E., the strata of this formation appear to be thin. At this mill, there is the following outcropping:

Outcropping at Goodwin's Mill in the S. W. 1-4 of N. E. 1-4 of S. 13, T. 14, R. 2 E.

[3]	Debris.	
[2]	Sandstone; highly ferruginous, of a dark red color, doubtless the *big sandy ore seam* of Blount county, etc., from	10 to 12 ft.
[1]	Sandstone; about	25 ft.

These strata are pushed over towards the north-west on the outcrop until they are more than vertical or have a dip of about 70 deg. to the south-east. To the north-east of here for from 3 to 4 miles, the Red Mountain (Clinton) ridge is comparatively low and irregular, and has frequent gaps in it. Its strata may be partly engulfed in a fault just to the south-east of it, as along the south-east foot of the ridge, they are in places in contact with loose Knox Chert. On the north-east side of a gap in this ridge at Mr. Rufus Beeson's Mill on Muckleroy's or Gin Creek near the center of the N. W. ¼ of S. 26, T. 13, R. 3 E., the ore has been drifted into in two places, but the roof has so fallen in as to almost cover the ore. The ore seam here on the outcrop is in wrinkles or waves. It is bent over until on the outcrop it has a dip of only about 20 deg. to the north-west, but in a short distance under cover it suddenly bends to a dip of about 40 deg. to the south-east. It then gently curves until in the bed of the creek it has a dip of about 60 deg. to the south-east and doubtless continues to curve or flatten until it gets its regular dip of perhaps 25 deg. to 30 deg. to the north-west. At the sharp bend, from 20 deg. to north-west to 40 to the south-east, the strata are all broken up, though the ore is continuous around the sharp curve. The ore at this sharp bend in the lower of the two drifts is about 16 inches thick, though in the upper drift, some 35 feet over the lower one, it is reported to be about 3 feet thick. Just above the sharp bend, in this upper drift, the ore shows a thickness of about 20 inches. At the mouth of the upper drift there is, just below the sharp bend in the strata, the following section:

Outcropping near the Center of the N. W. ¼ of S. 26, T. 13, R. 3 E.

[4] Shale; of a dark color.
[3] Shale; of an ochreous color, may carry a little ore...4 in.

[2] *Ore* .... 1 ft. 6 in.
[1] Shale; visible for .... 6 to 8 ft. 0 in.

The strata along Gulf or Dry Creek in the N. E. ¼ of N. E. ¼ of S. 18, T. 13, R. 4 E. can be seen to be in waves with a north-east and south-west trend. See Fig. 7. The strata of this formation are here pushed over towards the north-west on the outcrop until they have a dip of 60 deg. to 80 deg. to the south-east. On the southwest side of this creek, there is about the following outcropping:

Outcropping along Dry Creek in the N. E. ¼ of N. E. ¼ of S. 18, T. 13, R. 4 E.

(7) *Devonian; Black Shale.*
(6) Debris; from .... 4 to 5 ft 0 in.
(5) Sandstones; about .... 20 ft. 0 in.
(4) Shales, *Ore;* hard and yellowish shales with streaks of ore, about .... 15 ft. 0 in.
(3) *Ore*, shale; mixed .... 1 ft 1 in.
(2) *Ore;* badly weathered, soft or loose like a sandy loam .... 3 ft 6 in.
(1) Shale, visible to a thickness of from 10 to 15 ft 0 in.

The dip of (7) is from about vertical to about 85 deg. to the south-east, while that of (1) is from 60 deg. to 80 deg. to the south-east:

On the opposite or north-east side of the creek, there is an outcrop of ore in the lower strata of this formation or some 60 feet under [2] of the above section. It appears to be in 2 benches that are several feet apart. The upper and thicker bench, of alternate streaks of ore and shale, is about 18 inches thick. To the north-east, at Cobb's Mill, in the south-east corner of S. W. ¼ of N. W. ¼ of S. 3, T. 13, R. 4 E., the rocks of this formation are entirely engulfed in a fault, as bedded strata of the [f] Black Shale and [e] Silliceous [Knox] Dolomite and Chert are here in contact. The rocks of this formation set in again however within less than ½ mile to the north-east, as they were seen about opposite Steele Station, or in the S. E. ¼ of S. 34, T. 12, R. 4 E., where there are the outcrops of 2 ore seams. Both of these seams have been drifted into. At the mouth of the old drift in the upper seam, there is the following outcropping:

Outcropping in the S. E. 1-4 of S. 34, T. 12, R. 4 E.

[4]	Shale.	
[3]	*Ore*; from	1 ft. 3 in. to 1 ft. 4 in.
[2]	Shales; yellow	6 in.
[1]	*Ore*; about	2 ft. 6 in.

This ore is so well leached that it is called "*rotten ore*." It is of very light weight. The dip is about 75 deg. to the north-west. The lower seam is of a hard and firm ore, though sandy. It is reported to be about 18 inches thick. The strata here are so pushed and bent about as to have a very irregular strike.

Average samples of these ore outcrops, dried at 110 deg. C, gave the following analyses:

	[1]	[2]
Ferric Oxide	64.543	82.539
Silica	26.227	9.620
Phosphoric Acid	0.539	0.281

[1] A well leached ore from the upper seam. Analyst:—J. L. Beeson.

[2] A well leached ore from the lower seam. Analyst:—J. L. Beeson.

To the north-east, the ore outcrops get thinner until in the S. E. ¼ of S. 26, T. 12, R. 4 E., they are not over 6 inches thick. Along Little Canoe Creek, the county line, the lower rocks of this formation have a dip of about 80 deg. to the north-west, though the upper stratta are not so steep.

The Red Mountain [*Clinton*] *strata in the head of Greasy Cove*. These strata to the south-west of Little Canoe Creek, the county line, are in this county. In bending around the head of Greasy Cove, the rocks of this formation form an unusually broad broken strip or ridge. In the gap through the ridge, along the county line, made by Little Canoe Creek at Brothers' Mill, in the S. E. corner of S. 19, T. 12, R. 4 E., there are the outcrops of 2 and perhaps 3 seams or ore. The outcrop here of the top ore seam, is merely a deep red loam, that of the middle or second seam, showing merely as loose pieces of ore through about 2 feet of loam, is probably in a slide, and that of the bottom or third seam was not seen at all though it is said to be here. The dip in this gap is from 30 deg. to 35 deg. to the south-east. To the south-west for over a mile, the rocks of this formation form the top and north-west side of a high ridge. On the south-east side of this high ridge, near its top, and on its north-west side, there is loose ore scattered over the surface in the N. E. ¼ of S. 25, T. 12, R. 3. E., and along the top of the ridge there is a ledge of sandstone with a dip to the south-east. This loose ore must come from 2 different seams, most probably the uppermost 2 seams. The lower Red Mountain [Clinton] strata of this high ridge here unite with those of the ridge that comes down on the opposite or north-west side of the cove, or they here connect around the head of the cove in the lowest part of a deep depression from 300 to 400 yards wide. On the north-west slope of this depression or on the south-east side of the ridge that comes down on the north-west side of the cove, there are, in the N. E. ¼ of N. E. ¼ of S. 25, T. 12, R. 3 E., outcrops of 2 seams of ore from 25 to 30 feet apart. The upper of these 2 seams appears to be in

2 benches that are separated from each other by several feet of a soft material. There are from 12 to 20 inches of ore visible in each of these benches, and there may be some ore of each of them covered up by the debris between them. The lower seam crops out as boulders about 20 inches thick. These boulders may not represent quite the full thickness of the seam. The ore of this lower seam is a little sandy and, some of it, is a mere mass of large horn-like corals. The dip here is about 60 deg. to the north-west. The upper of these 2 seams crops out in a ravine in the N. W, ¼ of S. E. ¼ of S. 24, T. 12, R. 3 E. In this outcrop, it is said to be about 4 feet thick, though it appears to be less than 3 feet thick. It shows up as 2 benches that are only a few inches apart. The upper bench appears to be about 18 inches thick and the lower one only about 6 inches thick. This outcrop is partly covered by debris and so its full thickness of ore may not have been seen.

An average sample of this ore, on being dried at about 105 deg. C., gave the following analysis:

Ferric Oxide	51.148
Silica	10.450
Carbonate of Lime	35.826
Phosphoric Acid	0.875

Still farther around on this ridge or on the north-west side of the cove near the center of the N. E. ¼ of S.24, T. 12, R. 3 E., there is a great deal of loose ore, in large pieces, scattered over the south-east side of the ridge. This loose ore appears to come from the outcrops of 2 different seams.

The Synclinal Mountain between Clayton and Massey Coves. The portion of this mountain, the north-east end of it, that is within this county is almost wholy of the rocks of this formation. There are, however, on the top of it, especially along the Cahaba Branch in the bottom of the synclinal trough, spots with a thin coating or the overlying (g) Fort Payne Chert, and the lower parts of the mountain sides are of the underlying formation. High up on the north-west side of this mountain in the S. W. ¼ of N.E. ¼ of S. 9, T. 15, R. 1 E., there is an outcrop of a sandy ore seam that shows to a thickness of from 5 to 7 feet. Its dip is from 40 deg. to 50 deg. to the south-east. On this north-west side of the mountain, the upper strata of this formation along the road in the S. E. ¼ of S. W. ¼ of S. 3, T. 15, R. 1 E. have a dip of about 60 deg. to the south-east. Along this road lower down the mountain, there is the following outcropping:

Outcropping in the S. E. 1-4 of S. W. 1-4 of S. 3, T. 15, R. 1 E.

[14]	Debris.	
[13]	*Ore*; from	3 to 4 in.
[12]	Loam. may cover *soft ore*	4 in.
[11]	*Ore*	1 ft. 4 in.
[10]	Debris; partly of a very red or ferruginous loam, from	75 to 100 ft. 0 in.
[9]	*Ore*; quite good, believed to be about 4 feet thick, visible	2 ft. 6 in.
[8]	Debris; from	10 to 12 ft. 0 in.
[7]	*Ore*, Debris; the ore is in sandy calcareous streaks in the hebris, about	18 ft. 0 in.
[6]	Debris; about	40 ft. 0 in.
[5]	*Ore*; a ferruginous siliceous limestone, from	12 to 14 ft. 0 in.
[4]	Debris; about	70 ft 0 in.
[3]	*Ore*; a loose ferruginous sand.	
[2]	Debris; loose pieces of ore and sandstones along with loose nodules of Knox Chert, for several hundred yards, covers a fault.	
[1]	Knox Chert; in almost vertical ledges.	

The ore [11] has a dip of about 50 deg. to the south-east.

In the low gap through this mountain just to the south-west of the high point at its extreme north-east end or in the S. W. ¼ of S. 2, T. 15, R. 1 E., the surface rocks are a massive sandstone. On the south-east side of this gap, there is a good deal of loose ore over the surface. The highest up the hill of this ore has small rounded flinty pebbles in it.

The strip along to the north-west and around the north-east end of the Cahaba Coal Field. This strip for its whole distance to the north-west of the Cahaba Coal Field or to the south-west of Springville is partly engulfed in a fault. In its upper strata, just under the massive sandstones along the top of the ridge in the N. W. ¼ of N. E. ¼ of S. 27, T. 15, R. 1 E., there crops out an argillaceous siliceous ore that is scaly on the weathered surfaces. Some of this ore is in thin shaly pieces and some of it is in massive blocks. The thin shaly ore has the appearance of a siliceous clay-ironstone, while the massive blocks look more like argillaceous limonite. It is all too siliceous to be of value. In the S. W. ¼ of S. 23, T 15, R. 1 E., the ore is reported to be from only 6 to 8 inches thick. To the north-east, there is along the top of the mountain a rocky row of loose fine grain sandstones of a dark color. These rocks are bent over towards the south-east until they have a dip of about 60 deg. to the north-west. In the north-east corner of the N. W. ¼ of S. 23, T. 15, R. 1 E., there are the outcrops of two seams of ore. The upper seam in a fine gain sandy ore and the bottom one has in it the small rounded flint pebbles. They are each from 13 to 18 inches thick. An average sample of the upper seam, from two different places, on being dried at 110 deg.C., gave the following analysis :

Peroxide of Iron	53.248
Silica	44.738
Phosphoric Acid	0.408

Analyst, J. L. Beeson.

This mountain about 1 mile south-west of Springville is reduced to a line of low knolls, its strata along here being for the most part engulfed in a fault. In the gap through it just to the south of Springfield, there is an outcrop of light colored massive sandstones. Some of these sandstones are fine grained and have a quartzitic look, while others are so coarse grained as to be almost a conglomerate. They are bent over towards the south-east until the dip is from 80 deg. to 85 deg. to the north-west. They in their outcrops just to the south-east of Springville have a dip of about 55 deg. to the south-east. No ore has been seen in this mountain here opposite Springville, nor for some 2 miles to the south-west of Springville, though it occurs just to the north-east of this town where it is reported to be at first about 18 inches thick and then, in 4 to 5 miles around the north-east end of the Cahaba Coal Field. 3 to 4 feet thick. In 2 to 3 miles still farther, the ore is reported to be about 7 feet thick. near the foot of the sloping side of the mountain or at the top of this formation in the N. E. ¼ of S. 5, T. 15, R. 2 E., there is an outcrop of a massive fossiliferrous sandstone with a dip of about 20 deg. to the SSE. Along the top of the mountain here, in the S. W. corner of S. 33, T. 14, R. 2 E., there is a rocky row of very rough boulders of sandstones. Some of these sandstones are fossiliferous, some of them have a quartzitic look, and some of them are very ferruginous with splotches and thin seams and sheets of fine fibrous limonite. The surface around or near these boulders of sandstones is covered with nodules principally of sandstones though partly of conglomerates. There is an outcrop of a seam of very fine ore, though only 6 to 8 inches thick, in a short spur that extends out from the foot of the steep north side of the mountain in the S. W. ¼ of S. W. ¼ of S. 33, T. 14, R. 2 E. The dip of this ore is about 70 deg. to the south. Near the foot of the mountain on the steep north-east side near Mr. J. C. Bissell's in the S. W. corner of the N. E. ¼ of N. E. ¼ of S. 4, T. 15, R. 2 E., there is an ore outcrop that is said to be from 8 to 10 feet thick. It is however of very poor quality or is very sandy. These lower strata of this formation at Mr. James D. Jones' in the S. W. corner of the S. E. ¼ of N. W. ¼ of S. 3, T. 15, R. 2 E., appear to be almost in contact with those of Knox Chert, though they are doubtless separated from them by covered up Pelham [Trenton] Limestones. Some massive sandstones in the gap through the mountain just to the south-west of Mr. Jones' have a dip of about 45 deg. to the WSW.

The rocks of this formation in the S. W ¼ of S. 11, T. 15, R. 2 E., are exposed to a great thickness. They are principally of sandstones with near their bottom some conglomerates and some ore. Their dip is about 35 deg. to the WNW. In a short distance to the south, they are completely engulfed in a fault for between 1 and 2 miles, or to where the strata bend to the south-west to go down the south-east side of the Cahaba Coal Field. They again set in about in the S. W. ¼ of N. E. ¼ of S. 23, T. 15, R. 2 E., and continue to the south-west, just to the south-east of the north-east end of the Cahaba Coal Field, for several miles. They are however broken up and partly engulfed in a fault and so they may not be continuous for this distance. They first show to the south of the above gap in them as loose ore over some low knolls with flatwood [Cambrian] strata to the north and east, from which they are of course separated by a big fault. An ore outcrop in Mr. Bayless Lovell's field in the N. W. ¼ of S. E. ¼ of S. 23, T. 15, R. 2 E., has been dug into. It is of very good quality and is said to be from 8 to 10 feet thick. It is bent over towards the WNW. until its dip is about 15 deg. to the ESE. The strike at this outcrop is of a gradual bend or curve around towards the north. There is also an outcrop of ore near Mrs. Nancy Lovell's or in the N. W. part of the N. W. ¼ of S. W. ¼ of S. 26, T. 15. R. 2 E. It is from 4 to 5 feet thick and is bent over towards the north-west until its dip is about 40 deg. to the south-east. Average samples of these last two named ore outcrops, dried at 110 deg. C., gave the following analyses:

	[1]	[2]
Ferric Oxide..........	47.849	70.421
Silica................	26.465	20.009
Phosphoric Acid......	0.436	0.158

[1] From old pit in Bayless Lovell's field. Analyst, J. L. Beeson.

[2] Leached ore with a few large flattened rounded grains. From outcrop on Mrs. Nancy Lovell's place. Analyst, J. L. Beeson.

This formation just to the south-east of the Cahaba Coal Field in this county is completely engulfed in a fault to the south-west of its south-west end in the N. E. ¼ of N. W. ¼ of S. 34, T. 15, R. 2 E.

The strip along the top of Canoe Creek and Cedar Mountains. This formation occurs along the top and south-east side of Cedar Mountain in T. 14, R. 2 E., S's 32, 33, and 28, where its strata are in waves with a north-west and south-east trend. It is engulfed in a fault to the south-west of this mountain and to the north-east to about opposite Ashville or to the S. E. ¼ of S. E. ¼ of S. 7, T. 14, R. 4 E., where it again sets in and continues to the north-east, along the top of Canoe Creek Mountain, for some 5 miles to where it becomes engulfed in a fault again and continues so to within about a mile of Big Canoe Creek, the county line. It sets up again at this creek and continues on to the north-east up into Etowah county to the Coosa River a few miles below Gadsden. Its strata at the south-west end of Canoe Creek Mountain or to the south-east of Ashville are in contact on the south-east with Cambrain strata, [b] Coosa [Flatwood] Shales and Limestones, with, of course, a big fault between. To the north-east, however, Devonian and Sub-carboniferous strata soon come in to the south-east of them or between them and the fault. Along the top of the mountain in the S. W. ¼ of S. 4, T. 14, R. 4 E., there crops out a beautiful flagstone that is used for building chimneys, the fire places being lined with the red ore rocks, as they stand fire well or do not, as they say, burn out. These flagstones dip about 30 deg. to the south-east. The mountain is high along here and over its sloping south-east side, there is a great deal of loose ore. Some of this loose ore is in boulders of several tons in weight or from 4 to 5 feet in diameter and from 10 to 12 inches thick. The seam from which this loose ore comes is said to be from 24 to 30 inches thick. It is of very good ore. On the steep north-west side of the mountain, some 10 feet below the crest of the mountain in the S. W. ¼ of S. E. ¼ of S. 26, T. 13, R. 4 E., there is an outcrop of highly ferruginous conglomerate. In places it is nothing more than a mass of small rounded flint pebbles held together by ferric oxide. This conglomerate is believed to correspond to the *big ore* seam that is mined so extensively near Birmingham. Along the crest of the mountain, a little farther to the north-east, there is the following outcropping:

Outcropping in the S. E. ¼ of S. 26, T. 13, R. 4 E.

[5] *Ore:* very poor or sandy, in ledge, from............	1 ft. 6 in. to 2 ft. 0 in.
[4] Shale, *Ore;* in irregular alternate seams, some of the *ore* is of good quality but most of it is very sandy, visible to a thickness of about	1 ft. 6 in.
[3] Debris; about............	4 ft. 0 in.
[2] Conglomerate, Sandstone; ferruginous, in places a conglomerate and in other places a sandstone.	
[1] Debris.	

There is also along here a considerable sprinkling of loose ore over the sloping south-east side of the mountain that must come from a higher seam than [5] of the above outcropping. This ore is fossiliferous and has the flattened rounded grains in it. The outcrops along the top of the mountain are flattened until the dip is only 8 deg. to 10 deg. to the south-east while those at the top of the south-east slope have a dip of from 15 deg. to 20 deg. to the south-east, There is said to be considerable loose ore over the south-east side of the mountain to the north-east to near the center of S. 30. T. 13, R. 5 E. or to where this formation becomes engulfed in a fault for between 2 and 3 miles to the north-east or to within about 1 mile of Big Canoe Creek, the county line.

It here starts in as capping strata to a high cone-like mountain that are said to carry some good ore. In the gap to the north-east of this cone-like mountain, made by Big Canoe Creek, the county line, this formation appears to be for the most part engulfed in a fault. It thickens up very much just to the north-east of the creek, the county line.

The strip just to north-west of the Coosa Coal Field.

The rocks of this formation along the top and steep north-west side of Beaver Creek Mountain and Oak Ridge, the south-west end of that mountain, gradually thin out towards the south-west. They give out entirely before the county line on the south-west is reached. At the county line on the north-east, the Coosa River, they are highly developed, being made up of sandstones and shales with some ore. The ore outcrops in S. 22, T. 14, R. 4 E. are reported to be not quite 2 feet thick.

To the south-east of the Coosa Coal Field.—To the south-east of the Coosa Coal Field, this formation is but very poorly developed and makes but very little surface area. It consists, so far as has been seen, of only a ledge of sandstone of from 1 to 10 feet thick along the tops of the (g) Fort Payne Chert ridges of the north-west belt of these cherty rocks and the underlying (d) Pelham (Trenton) Limestones. This sandstone in its outcrop on the north-west side of the mountain in the S. E. ¼ of N. E. ¼ of S. 33, T. 15, R. 4 E. is a fine grain gray rock, and, as a back-bone to the ridge passed through by the G. P. R. R. at the tank about ½ mile west of Eden, it is a hard white quartzitic sandstone. In the gaps through this ridge farther to the south-west or in the S. E. ¼ of

S. E. ¼ of S. 18, T. 17, R. 3 E. and the S. E. ¼ of S. E. ¼ of S. 24, T. 17, R. 2 E., it is a golden yellow quartzitic sandstone.

(4) *Devonian*, (f) *Black Shale*.—This formation occurs in all of the ridges and mountains of [e] Red Mountain [Clinton] Formation and [g] Fort Payne Chert to the north-west of the Coosa Coal Field but has not been seen in a single place to the south-east of that coal field. It varies in thickness from 0 to about 40 feet, and covers but very little surface area. It does not show itself in a great many places from the fact that it soon crumbles and becomes covered up on exposure to the air. It however shows in a good many places in the line of outcrops just to the south-east of the Blount and Chandler mountains. An outcrop of it is to be seen on each side of Dry Creek in the N. E. ¼ of N. E. ¼ of S. 18, T. 13, R. 4 E. These two outcrops are each from 20 to 25 feet thick and are pushed over towards the north-west until their north-west dip is changed to one of from 50 deg. to 85 deg. to the south-east. See Fig. 7. An outcrop at Cobbs' Mill, in the south-east corner of S. W. ¼ of N. W. ¼ of S. 3, T. 13, R. 4 E., is in contact on the south-east side with [c] Siliceous [Knox] Dolomite and Chert. There is of course a big fault between the two. This outcrop is bent over towards the north-west until the north-west dip is changed to one of about 75 deg. to the south-east.

This formation shows in a good many places also in Greasy Cove. An outcrop of it shows on each side of Little Canoe Creek, the county line, at Brothers' Mill in the S. E. ¼ of S. 19, T. 12, R. 4 E. It has not been seen on the broad synclinal mountain between the Clayton and Massey coves in the south-west part of the county, though it doubtless occurs in places on this mountain.

It shows in places in the line of outcrops just to the north-west and north-east of the Cahaba Coal Field.

This line of outcrops becomes enguled in a fault for about a mile to where it perhaps sets up again and continues for a short distance before becoming engulfed for good in the big fault that runs down the south-east edge of the Cahaba Coal Field.

This formation occurs in both the Canoe Creek and Cedar Mountain. An outcrop at the south-west end of Canoe Creek Mountain or in the Greensport road about a mile south-east of Ashville, shows to a thickness of about 30 feet. It is here about vertical and is just under a bluish shale with interstratified seams of a hard fine grain dark grey sandstones that belongs at the bottom of the [g] Fort Payne Chert Formation.

This formation occurs in Beaver Creek Mountain and Oak Ridge, the south-west end of this mountain, though it is very variable and appears to even give out entirely before the county line on the south-west is reached. An outcropping in this mountain in the S. W. ¼ of N. E. ¼ of S. 29, T. 14, R. 4, E., is about 12 feet thick.

This formation is believed to be entirely wanting to the south-east of the Coosa Coal Field.

[5] *Lower Sub-carboniferous*, [g] *Fort Payne Chert* [Tuscumbie Limestone and Lauderdale Chert.] This formation occurs both to the north-west and south-east of the Coosa Coal Field. It is in narrow belts of principally the tops and more sloping sides of ridges with a general north-east and south-west direction, though in places its upper strata are of narrow valleys along the foot of the ridges. It does not cover over 35 square miles of the surface area of the county. It is from 150 to 275 feet thick.

To the north-west of the Coosa Coal Field, it is of a belt along just to the south-east of the Blount and Chandler mountains, of patches over the top of the broad synclinal mountain between the Clayton and Massie coves, of a belt along just to the north-west and north-east of the Cahaba Coal Field, of one over the south-east sides and tops in places of the Cedar and Canoe Creek mountains, to the south-west and north-east of Ashville, and cf one over the tops and sloping south-east sides of Beaver Creek Mountain and Oak Ridge. The strata of the belt along just to the south-east of the Blount and Chandler mountains in their out-crops along Dry Creek in the N. E. ¼ of N. E. ¼ of S. 18, T. 13, R. 4, E., can be seen to be in waves with a north-east and south-west trend. This outcrop is also flattened until its south-east edge is reached when it is suddenly bent over towards the north-west until its dip is more than vertical or is from 60 deg. to 85 deg. to the south-east. See Fig. 7. The upper strata of this formation at the head of Greasy Cove help to form a narrow valley. In them, there was seen several cherty boulders of the large coral, *lithostrotion canadense*.

The patches over the top of the synclinal mountain between the Clayton and Massie coves are small, and of the cherty strata near the bottom of the formation. They are thin and are nothing more than the last remnants of this formation that once covered the whole mountain.

The belt along just to the north-west and north-east of the Cahaba Coal Field appears to be thinner and to have less cherty strata than most of the other belts. Its upper strata, but little cherty, form in places at least either a narrow valley or a part of the broad valley between its ridge and the Cahaba Coal Field. This belt as it starts to bend around the south-east corner of the north-east end of the Cahaba Coal Field is engulfed in a fault for about a mile. On starting up again, it is continuous for about a mile before it becomes engulfed for good in the big fault that runs down the south-east edge of the Cahaba Coal Field.

The belt that covers the south-east sides and in places the tops of Cedar and Canoe Creek mountains is only about 1 mile long on Cedar Mountain and 6 miles long on Canoe Creek Mountain. Between these mountains and to the south-west and north-east of them, it is engulfed in the north-ward curves of a fault. There is however a small patch of its strata just south-west of Big Canoe Creek, the county line on the north-east. The lower 20 feet of its strata in places at least, as near the south-west end of Canoe Creek Mountain, is of shales and sandstones.

The lower cherty strata of the Beaver Creek Mountain and Oak Ridge belt where cut through by Kelly Creek in the S. W. ¼ of N. E. ¼ of S. 29, T. 16, R. 2, E., carry a seam of regularly stratified limonite. This ore on the outcrop is in large boulders in a clayey loam matrix of a dirty yellow color. The seam however is reported to be over 5 feet thick. Its cover is of hard ledges of chert and its underbed is said to be, so far as seen, a red loam. The ore for the most part is cellular. Some of it is of very fine quality, while some of it is cherty or clayey. Its cherty matter is in streaks and splotches. It carries some beautiful specimens of needle ore. It is reported to be low in phosphorus.

The limonite in the lower cherty strata of this formation show in other places to the south-west and north-east of the above locality, though not to the same extent. This ore occurs in places also in much higher cherty strata, as on the south-east side of Oak Ridge in the S. W. ¼ of N. E. ¼ of S. 15, T. 16, R. 2 E., where it appears to run vein-like across the stratification. It is here several feet in thickness and when seen had been dug into to a depth of about 6 feet.

Manganese ore is said to occur in the cherty rocks along the top of the Oak Ridge in the south-east corner of S. 36, T. 15, R. 2 E.

This formation where crossed by the Ashville and Fairview road in the S. W. ¼ of N. E. ¼ of S. 29, T. 14, R. 4 E., crops out on the steep north-west side of Beaver Creek Mountain and is from 160 to 175 feet thick. Its lower half is of hard ledges of chert. It is much thinner where crossed by the Ashville and Ragland road to the north-east. It is therefore variable in thickness. Its cherty strata help to form the shoals across the Coosa River just below Greensport.

The strips of this formation to the south-east of the Coosa Coal Field are of the same two belts of country described under (d) Pelham (Trenton) Limestones. These belts, as has been stated, are made up of repeated narrow strips of this formation and of overlying and underlying strata. As the general dip of all the strata in these belts is to the south-east, faults must occur between the repetition of strata. The strips of this formation are of the tops and south-east sides of sharp crested ridges. They carry in many places, the stratified seams of limonite.

In the north-west belt, there are two strips of this formation that extend from near the county line on the north-east to the south-west for 6 to 7 miles to where the south-east one gives out. The north-west one continues on to the south-west to within about a mile of Eden on the G. P. R. R. After the north-west strip passes Old Broken Arrow, it bears off from the edge of the Cool Measures and there comes in to the north-west of it, between it and the Coal Measures, an other strip or ridge that to the south-west, at least, is of this formation. This last or third strip continnes to the south-west to within a few miles of the county line. The north-west of the two strips in the north-east part of the county sets in just to the south of Singleton on the E. & W. R. R., while the south-east one crosses the river from Calhoun county. The south-east one however extends to the south-west only to the N. W.¼ of S.E. ¼ of S.19,T. 15 R. 5 E. when it curves and stops as it butts up against the other ridge or strip. In the cherty strata on the south-east side of this south-east ridge, in S's 1 & 12, T. 15, R. 5 E., there is some manganese ore, *pyrolusite*. The north-west ridge as far to the south-west as Broken Arrow Creek is known as the *Mitchell* (*Dodrell*) *Mountain*. On its south-east side in the N. E. ¼ of N. W. ¼ of S. 34, T. 15, R. 4 E., in the lower strata of this formation, there is an outcrop of the stratified limonite. The ore here is about 3 feet thick, though in places it is a very poor or cherty ore. A few feet over it, there is a seam of ferruginous chert with a rough weathered surface that has sharp edges. This mountain or ridge stops suddenly within about a mile of Eden. For some 2 miles before it gives out, there is to the north-west of it the third ridge of the belt that to the south-west, at least, is of this formation. In a gap through this third ridge in the S. W. ¼ of S. W. ¼ of S. 17, T. 17, R. 2 E., there is a bluish bituminous limestone with projecting seams of bluish flinty chert. In another gap to the south-west, in the S. E. ¼ of S. E. ¼ of S. 24, T. 17, R. 2 E., the bluish flinty chert of this formation shows to a thickness of about 100 feet. Just under it, there is a massive ledge of white and orange sandstone that may be of this formation, though it is believed to be of the (c) Red Mountain (Clinton) Formation.

In the south-east belt, there sets in on the west bank of the Coosa River, the county line, a low ridge of this formation that extends to the south-west about a mile before it becomes entirely engulfed in a fault. The strata of this ridge form the lower end of the Broken Arrow Shoals. Another ridge or strip of this formation starts up in the N.E. ¼ of N.E. ¼ of S. 16, T. 16, R. 4 E., about 300 yards south of Broken Arrow Creek, and contines to the south-west, with the exception of one little break, to the county line. The stratified limonite shows in a good many places on the south-east side of this ridge. Its outcrop in the S. E. ¼ of S. E. ¼ of S. 17, T. 16, R. 4 E., is of a solid ledge about 3 feet thick of very good ore. In the N.E. ¼ of S. 30, T. 16, R. 4 E., this ore shows as loose ore to a considerable quantity in among loose chert. The most of it here however is cherty. In a shallow cut on the E. & W. R. R. in the N. E. ¼ of N. E. ¼ of S. 36, T. 16, R. 3 E., the ore is in two stratified seams in the upper part of this formation. These two seams are about 10 feet apart. The upper one is about 33 inches thick and the lower one is from 8 to 12 inches thick. The lower seam is of very variable thickness and is of not as good ore as is the upper seam. This ore has a black waxy appearance. It is very high in phosphorus, as shown by the following analysis of an average sample:

Ferric Oxide	76.303
Silica	4.315
Phosphoric Acid	3.736

Analyst:—J. L. Beeson.

These ore outcrops are pushed over towards the north-west until their south-east dip has been changed to on of about 75 deg. to the north-west.

The above two seams of ore show again in about mile to the south-west, where they are about 12 fee apart and the thicker or upper one is about 30 inche thick. The ore here is of very good quality. The fossil in the chert here and to the south-west are almost obliterated.

The break in this ridge occurs in the N. W. ¼ of S. E. ¼ of S. 10, T. 17, R. 3 E. On the south-west side of this gap in it the strata are several hundred yards farther to the north-west than on the north-east side. To the south-west of the gap for some 3 miles, the strata of this formation in places are almost squeezed out by the (h) Oxmoor Shales and Sandstones on each side of them. Over their outcrops in the western part of the N. W. ¼ of S. 28, T. 17, R. 3 E., there is a great deal of loose limonite of very good quality. In one place here, the ore is said to look as if it was about 15 feet thick. It is probable about vertical and naked to this depth, though it is not likely over 3 feet thick. A good average sample of this ore, dried, gave the following analysis:

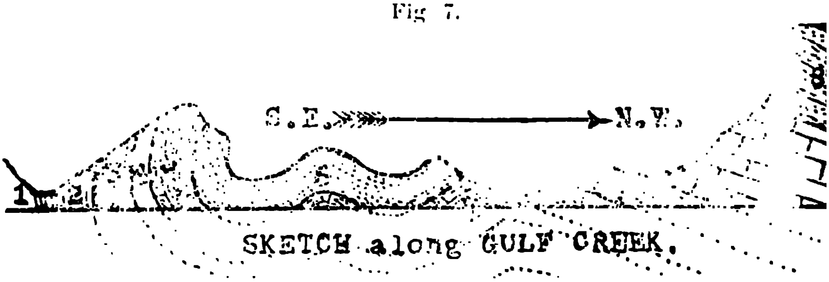
Ferric Oxide	77.575
Silica	15.504
Phosphoric Acid	1.140

To the north-west of the above ridge for some three miles north-east of Kelly's Creek, there is another ridge or strip of this formation. These two ridges or strips are separated by a narrow valley with a fault between a strip of (h) Oxmoor Shales and Sandstones on the north-west and one of (d) Pelham (Trenton) Limestones on the south-east. There appears to be, for about a mile to the north-east of Kelly's Creek, to the north-west of the above two ridges, another strip of this formation, and to the south-east of them one or more strips of it. These bordering strips however are very indistinct and may be nothing more than spurs of the two main ones. The north-west of the two main ridges or strips sets in suddenly on the east bank of Camp Creek in the N. E. ¼ of N. E. ¼ of S. 31, T. 17, R. 3 E. This ridge is said to have on its south-east side in the S. E. ¼ of S. E. ¼ of S. 1 T. 18, R. 2 E., a fine showing of limonite as a ledge about 3 feet thick and a great deal of loose ore.

(6) *Upper Sub-carboniferous* (h) *Oxmoor Shales and Sandstones* (*Bangor Limestones and Hartselle Sandstones.*) This formation from 800 to 1500 feet thick covers nearly 1-5 or about 120 square miles of the surface area of the county. To the north-west of the Coosa Coal Field, it is of three comparatively broad belts. One of these belts is just along to the south-east of Blount Mountain and around the Chandler Mountain; another one is along just to the north-west and north-east of the Cahaba Coal Field; and the third one is along just to the north-west of the Coosa Coal Field. These three belts, in a general way, are made up of shales, sandstones, and limestones. The shales are usually black and fissile, the sandstones thin with exception of at or near the bottom of the formation, and the limestones with the exception of in the north-west belt are merely in places, as detached boulders in the shale. The limestones decrease in extent towards the south-east as the shales and sandstones increase.

The north-west belt or the one along just to the south-east of Blount Mountain is from ½ to 2 miles wide. Its bottom sandstones, though massive, do not usually form a separate ridge, but rather the north-west side or portion of the high ridge of mainly the underlying (g) Fort Payne Chert and (e) Red Mountain (Clinton) Formation. Its limestones are more or less in patches or are much higher developed in places than others. The bottom sandstones on the south-east side of Crawford's Cove at the south-west end of Chandler Mountain form some naked glady places and some low flat lands with a thin poor soil. They are seen in places in waves with a north-east and south-west trend. These waves show most plainly in the S. W. ¼ of S. W. ¼ of S. 8, T. 13, R. 4 E., where the lower strata or massive sandstones (Hartselle) are cut through by Gulf or Dry Creek. The accompanying Figure 7 is a rough sketch of the outcrops along this creek.

Fig 7.



(8) Coal Measures capping Mount Chandler, (7) Bangor Limestones, (6) Hartselle Sandstone, (5) Fort Payne Chert, (4) Black Shale (Devonian), (3) Red Mountain (Clinton), (2) Pelham (Trenton) Limestones, (1) Siliceous (Knox) Dolomite and Chert.

The lower limestones of this formation, those just over the Hartselle Sandstone, make some fine farming lands in Crawford's Cove. A few feet of limestones occur in places under the massive limestones or at the very bottom of the formation. The bottom sandstones (Hartselle Sandstones) are very massive around the north-east end of Chandler Mountain, forming high bluffs along little Canoe Creek, the county line. This creek to the north-west of Chanler Mountain, up to where it comes through the (g) Fort Payne Chert Ridge, is about the north-west boundary of the massive sandstone or of the formation. The few feet of limestones at the bottom of the formation are said to form a natural bridge over the creek in the south-west corner of S. 21, T. 12, R. 4 E. The bottom massive sandstones show plainly in their curve around the head of Greasy Cove. They curve around in about ½ mile of the very head of the cove and in this curve they can be seen to form an arch over the top of the anticlinal of the cove. There is but very little ascent from the head of this cove to the top of the McClendon Gap, between the south-west end of the Chandler Mountain and Blount Mountain, but the vertical decent from the top of this gap out into Crawford's Cove is at least 250 feet. The head of Greasy Cove is therefore some 200 feet higher than the head of Crawford's Cove. In the head of Greasy Cove and in the McClendon Gap, there is a fine exposure of crinoidal limestones.

The belt along just to the north-west and north-east of the Cahaba Coal Field is from ¼ to ½ mile broad. The portion to the north-west of the coal field is very broken and has along its north-west edge a ridge of the massive sandstones at or near its bottom. These sandstones do not form a separate ridge around the north-east end of the coal field. The strata over them, more or less calcareous, make here a beautiful fertile valley. These strata must be quite thick, as they, with a considerable dip to the south-east, not only form a valley about ½ mile broad but also show to be a height of some 200 feet up on the side of the mountain capped with Coal Measures to the south-east of this valley.

This belt from a short distance north-west of Truss' Upper Mill, in the S. W. ¼ of N. W. ¼ of S. 14, T. 15, R. 2 E., to the south-east for nearly a mile is partly engulfed in a fault that brings its strata in contact on the east with (b) Coosa (Flatwood) Shales and Limestones. The strata along this fault are of black fissile shales, thin bedded sandstones, and crinoidal limestones. This belt, after rounding the south–east corner of the north–east end of the Cahaba Coal Field and starting down the south–east side of the coal field, becomes engulfed entirely in the big fault that bounds this coal field on the south–east.

This formation may occur, as short narrow patches, along the south–east edge of Cedar and Canoe Creek mountains.

The belt just to the north–west of the Coosa Coal Field is from about ¾ to 2 miles wide and extends clear through the county from north–east to south–west. It makes for the most part a broken piney woods country of shales and sandstones. In places, however, it is mostly of a low flat poorly drained valley, with occasional outcrops of limestone. The shale in places is very black and fissile. The massive sandstone at and near the bottom forms the "Sand Ridge." In places, these sandstones do not form a separate ridge but occur over the top and south–east side of the Oak Ridge and Bear Creek Mountain of principally the underlying (g) Fort Payne Chert, (e) Red Mountain (Clinton) Formation, and (d) Pelham [Trenton] Limestones. Just over these massive sandstones, there is seemingly a large quantity of limonite in Shoal Creek Valley in S's. 12 & 1, T. 16, R. 2 E, and in S. 6, T. 16, R. 3 E. This ore appears to be regularly stratified and to dip about 30 deg. to the south-east. It is said to be in places in two seams that are from 12 to 15 feet apart. It crops out in places on the side of the high ridge of the underlying massive sandstones to the north-west. In the lower part of the valley, it is reported to be usually about 10 feet below the surface, with a cover of merely loose sand or yellow sandy loam. A well or test pit dug in any part of the valley within the above area will strike this ore, so it is said. The ore is of course thicker in places than it is in others. It is reported to range in thickness from about 3 feet to between 5 and 6 feet. This thickness is believed to be too much. It is for the most part of poor quality, being too siliceous or sandy, though much of it is a very good ore. Much of it consists of sandy masses with thin streaks of good ore. It is nearly all cellular or full of cavities. Some of the cavities have a velvety coating. Much of it has a concretionary appearance. It carries some *botryoidal ore* and some fine specimens of *needle ore*.

A seam of compact limonite of a scarlet color occurs in places in the lower part of the massive sandstones at the bottom of the formation, as shown in an outcrop on the Ashville and Fairview road in the south-west corner of N. E. ¼ of S. 29, T. 14, R. 4 E. It is of poor quality or is too siliceous to be of much value. Here, these massive sandstones are immediately on top of the (g) Fort Payne Chert. They cap Beaver Creek Mountain and show to a thickness of about 100 feet on the north-west sides of two high peaks of the mountain between which the above road passes. These sandstones next to the river, county line on the north-east, form a bench or low ridge with a considerable quantity of loose limonite over the surface. Some of this ore is of very good quality. The valley of Shoal Creek, over higher strata of the formation, is made up here of principally low flat lands of a light mulatto soil that is so cold and poorly drained as to be of very little value for agricultural purposes.

This formation to the south-east of the Coosa Coal Field makes not only the broken country between the two belts to which the strips of (g) Fort Payne Chert and [d] Pelham (Trenton) Limestones are confined but occurs also itself as narrow strips in these belts. It is almost wholy of shales and sandstones, there having been seen only a few patches and separate boulders of limestones. The shales are usually sandy, black, and fissile. The sandstones are hard and quartzitic and have over their weathered surfaces shining quartz crystals. They are mostly thin bedded. The limestones, usually of a dark bluish color, are full of calcite streaks. The country made by this formation between the above two belts is for the most part broken and covered with a large growth of long leaf pine, though it has some patches of short leaf pine and of stunted hard timber. The Coosa River, the county line, after it passes from out of the Coosa Coal Field, is in the strata of this formation to the lower end of the Broken Arrow Shoals, except as it crosses a narrow strip of [g] Fort Payne Chert and [d] Pelham [Trenton] Limestones. To the south-east of the above two belts, this formation is in contact on the south-east with a broken country of [c] Siliceous [Knox] Dolomite and Chert, with of course a big fault between. Its strata along this fault are in places covered with the Silurian strata that have been pushed over towards the north-west from south-east of the fault. South of Broken Arrow Creek and along the fault for several miles, the strata of this formation have been covered up for between 1 and 2 miles to the north-west of the fault. The pushed over Silurian strata make a very broken country that has extending out from its north-east end three high points that are known as "Hog Mountain," "Still-house Mountain," and "Blue Point Mountain." The shales of this formation can be seen in the short deep narrow hollows that extend back into the broken country between these mountains and in places half way up the sides of the high points. They show also along the fault or between the broken country of thrust over Silurian strata and the broad broken country of similar strata to the south-east of the fault. Some of these shales are so black that they have been dug into for coal. They, with a massive sandstone, form the Box's Shoals across the Coosa River near the center of S. 2, T 16, R. 4 E. The weathered surface of this sandstone to a depth of from ½ to ¾ of an inch is of a reddish brown color while its interior is gray and calcareous.

The limestones show up better around PellCity than in any other known place. They are for the most part impure or siliceous, though some of them appear to be quite pure. They are mostly of a blackish blue color, though some of them are of a grayish blue color. They occur in ledges and in detached boulders and nodules. They are full of calcite streaks which cover the weathered sufaces with a net work of prominent vein like seams. Some of them are full of crinoidal stems. They occur along with the black shale and with porous or leached calcareous sandstones having the prominent calcite streaks over their weathered surfaces.

A group of sulphur and chalybeate springs occur in the strata of this formation in a low flat place in the S. W. ¼ of N. W. ¼ of S. 30, T. 16, R. 4 E.

Just under the massive ledge of hard quartzitic sandstone that occurs along the ridge just to the south-east of the Coosa Coal Field to the south-west of Old Broken Arrow, there is in places considerable black waxy limonite. This ore appears to be from a regular stratified seam. It is high in metallic iron, and probably also in phosphorus. It shows near the north-east end of the sandstone ridge in the N. E. ¼ of S. E. ¼ of S. 23, T. 16, R. 3 E. and also in N. W. ¼ of S. W. ¼ of S. 26, T. 16, R. 3 E. There is also in places some limonite just over this sandstone ledge. This ore, so far as has been seen, however, is made up of concentric rings and is not so high in iron as the ore under the sandstone.

Several small faults can be plainly seen in the cut several hundred yards east of Eden, on the G. P. R. R. From a well in the black fissile shale of this formation near the center of the E.½ of N. E. ¼ of S.17,T.17,R.3 E., there were dug many kidney shape balls that were beautiful specimens of altered pyrite. They had nuclei of iron pyrites and exterior portions of clay iron stone or clayey limonite. These balls were once wholy iron pyrites. Some of the black fissile shales have a copperas or iron rust stain.

(7) *Carboniferous* (i) *Coal Measures.*—This formation covers nearly 200 square miles or ⅓ of the surface area of St. Clair county. Of this area, some 25 square miles are of the Warrior Field, nearly 40 square miles are of the Cahaba Field, and nearly 150 square miles are of the Coosa Field. It, in all of these fields, has been considered more or less fully in previous reports; that of the Cahaba Field in the Cahaba Coal Field Report, published in 1890; that of the Warrior Field in the Plateau Report, published in 1891, and the Blount Mountain Report, published in 1893; and that of the Coosa Field in the Plateau Report, published in 1891, and the Coosa Coal Field Report, published in 1895.

That of the Warrior Field is said to have a maximum thickness of over 800 feet of strata with at least 4 seams of coal. Two of these coal seams are given as 2 feet and over in thickness.

The part that is of the Cahaba Field is said to have a maximum thickness of about 4,350 feet of strata with 17 seams of coal that range in thickness from 6 inches to 11 feet 6 inches and that have an average combined thickness of nearly 50 feet of coal. It is reported that 10 of the 17 coal seams have each an average thickness of 2 feet and over, that 7 of these 10 coal seams have each an average thickness of 3 feet and over, that 3 of these 7 coal seams have each an average thickness of 4 feet and over, that 2 of these 3 coal seams have each an average thickness of 5 feet and over, and that 1 of these 2 coal seams has an average thicknes of over 10 feet.

The part that is of the Coosa Field, according to Mr. A. M. Gibson, is of several basins and sections which he designates as the *Ragland Basin*, *Fairview Section*, *Coal City Basin*, *Black Ankle Basin*, and *Kelley Creek Basin*. He pronounces the coal to be of the very best quality, especially for coking, but rather soft for transporting.

In the *Ragland Basin*, he says that only one coal seam, the *Ragland Seam*, has been worked, though there are other seams. This seam, he says, covers about 1000 acres and is of good coal.

The *Fairveiw Section* comprises from 35 to 40 square miles. Its strata are estimated by Mr. Gibson at a maximum thickness above the First or Bottom Conglomerate of 4,650 feet with 16 coal seams. One-half of these coal seams are said to be thick enough to be worked, seven of them being from 3 feet to 4 feet 4 inches each in thickness, and the other one being over 30 inches thick.

The *Coal City Basin* is estimated as having a maximum thickness of Coal Measures of about 5,750 feet with 12 seams of coal of 3 feet and over each in thickness and a combined thickness of nearly 50 feet of coal. One of these coal seams is given as 6 feet thick, another as 5 feet thick, and four others as over 4 feet each in thickness.

The *Black Ankle Basin*, comprising from 2,000 to 2,500 acres, and *Kelly Creek Basin*, of from 20 to 25 square miles, are not very well known. They are both believed, by Mr. Gibson, to have a great thickness of Coal Measures and to be most probably rich in coal. Only one coa seam, however, of any appreciable thickness, 23 inches is known of in the former basin, and two, the thicker o which is about 3 feet thick, in the latter basin.

Only the coals of the Coosa Field are worked withi this county. They funished, according to the Sta Mine Inspector, of the coal out-puts for the State 1895 and 1896, respectively 30,806 and 33,368 tons.

CHAPTER VIII.

JEFFERSON COUNTY.

The surface area of Jefferson county is made up of the following formations:

[7] *Carboniferous*	[i] *Coal Measures*	200-5000 feet
[6] *Upper Sub-carboniferous*	[h] *Oxmoor Shales and Sandstones*	800-1200 feet
[5] *Lower Sub-carboniferous*	[g] *Fort Payne Chert*	250-300 feet
[4] *Devonian*	[f] *Black Shale*	0-10 feet
[3] *Upper Silurian*	[e] *Red Mountain [Clinton] Formation*	400-650 feet
[2] *Lower Silurian*	[d] *Pelham [Trenton] Limestones*	600-1200 feet
	[c] *Siliceous [Knox] Dolomite and Chert*	2000-3000 feet
[1] *Cambrain*	[b] *Coosa [Flatwood] Shales and Limestones*	400-1500 feet
	[a] *Montevallo [Variegated] Shales and Sandstones*	150+ feet

The surface area of the entire county, with the exception of the Birmingham Valley and the small part of the Cahaba Valley that is within the county, is of the Coal Measures. The Birmingham Valley comprises about 330 square miles and the Cahaba Valley about 20 square miles of the county. The location and structure of these valleys can be seen from the State Geological Map and from the structure sections, Plate XXXV. This map and these sections show the north-west sides of the above two valleys to be more or less complicated and faulted and to have their formations not in the same regular order as the south-east sides.

(1) *Cambrian.*—This group, visible to a maximum thickness of over 1500 feet, covers less than 75 square miles of the surface area of the county. It makes a belt along the center and one along north-west side of the Birmingham Valley, and one also along the north-west edge of the Cahaba Valley. Its strata are of the

(b) *Coosa (Flatwood) Shales and Limestone and* (a) *Montevallo (Variegated) Shales and Sandstones.*

[a] *Montevallo [Variegated] Shales and Sandstones.* These strata have been seen in only one place in the Birmingham Valley, namely:—Along the Birmingham and Bessemer Dummy Line in the N. W. ¼ of N. W. ¼ of S. 18, T. 18, R. 3 W., in a narrow valley between Siliceous [Knox] Dolomite and Chert ridges or just to the north-west of the cherty ridge of the narrow unsymmetrical synclinal that branches off from the Cemetery Ridge about north-west of Powderly. They show here in two outcrops, about 100 yards apart, that are just north-west of a fault. The north-east outcrop is of pink, yellowish white, light gray, and golden colored shales, and of yellow ochreous colored sandstones and of straw and orange colored loams. The yellow shale is seen to change in places to a hard light yellow and golden colored fine grain massive rock that in texture somewhat resembles lithographic stone. This rock gradually changes upward into a rock with pinkish splotches and then into pinkish shales. Covering them, there is first the straw colored and then the orange colored loams. The straw colored loam is doubtless from the weathering of golden colored shales, as these shales can be seen in it along with some calcareous cherty concretions. The orange colored loam has in it seams of a porous or thoroughly weathered golden yellow sandstone of very light weight. This outcrop is in a double set of waves, one with a north-west and south-east trend and the other with a north-east and south-west trend. The other outcrop is of pinkish and light yellowish shales with a greenish tinge.

The Cambrian strata of the Cahaba Valley in Jefferson county are of a narrow belt along the north-west edge of that valley, next to or just south-east of the great thrust fault (Rome and Cahaba Thrust Fault) that bounds the Cahaba Coal Field on the south-east. This narrow belt varies in width from about ¼ mile at the county line on the south-west to about 100 yards at the county line on the north-east. Its south-west or widest portion is of a sharp crested ridge next to the fault and a narrow valley just to the south-east of this ridge or between this ridge and the ridges of Siliceous (Knox) Dolomite and Chert to the south-east. The sharp crested ridge and perhaps the most north-western part of the narrow valley to the south-east of it is of the variagated sandstones and shales of this formation. The belt of sandstones and shales of this formation are therefore in contact with the fault or Coal Measures on the north-west.

(b) *Coosa (Flatwood) Shales and Limestones.* This formation comprises all of the Cambrian strata in the Birmingham Valley with the exception of the two outcrops mentioned of Montevallo (Variegated) Shales and Sandstones on the Birmingham and Bessemer Dummy Line, but it appears to make but very little of the Cambrian strata in the Cahaba Valley. In the Birmingham Valley, its limestones crop out in many places as ledges, with a general north-east and south-west trend, that are very disagreeable to pass over with a vehicle of any kind. These limestone outcrops often form naked cedar glades. Some of them are massive gray rocks with on the weathered surfaces dirty clayey looking splotches and seams. The belts of the Birmingham Valley are for the most part low, flat, poorly drained valleys (fatwoods) that are of broken or faulted subordinate anticlinals. Along the south-east edge of the south-east of these belts, however, or between the flatwoods and the ridges of Siliceous (Knox) Dolomite and Chert on the south-east, or just to the south-east of the A. G. S. R. R., there is a belt of low rounded ridges of a deep red loam with a hard flinty looking sandy shale, loose over the surface and in thin shaly sheets or seams. This loam with its shales is from the weathering of limestones with thin sheets or seams of siliceous or cherty matter that properly belongs at the top of this formation (Upper Connesauga) though they have usually been placed at the bottom of the overlying (c) Siliceous (Knox) Dolomite and Chert Formation. These red loams and shales occupying unsymmetrical synclinals, occur also in places in the flatwoods.

The north-west belt of the Birmingham Valley sets in a couple of miles south-west of Haygood X Roads and continues to the south-west, just south-east of the big fault (Murphrees Valley and Little Basin Fault), to about opposite or northwest of Wheeling. It gradually comes to a point at each end, being near a mile wide at its center or widest part. Its south-west half is known as "Opossum Valley." Its strata along the fault are in contact with one and then another of much later formations, as high up as the Coal Measures. Along its south-east edge, there are outcrops of light gray and deep blue massive limestones and dolomites that most probably belong at the bottom of the overlying (c) Siliceous (Knox) Dolomite and Chert Formation (Upper Connesauga.)

The central belt of the Birmingham Valley extends from near Chalkville P. O. to the south-west to far beyond the county limits. Its strata, however, over a low ridge that extends diagonally across this belt from about north-west of East Lake under Birmingham to old Elyton are covered by a deep read loam that has come from the weathering of the rocks usually placed at the bottom of the overlying (c) Siliceous (Knox) Dolomite and Chert Formation (Upper Connesauga). This low ridge of red loam occupies a narrow unsymmetrical shallow synclinal trough with on its south-east side a very steep north-west dip and, in places at least, a fault. Another, a still narrower unsymmetrical synclinal starts out from the Cemetery Ridge or broken country of (c) Siliceous (Knox) Dolomite and Chert that separates the two belts of this formation in the Birmingham Valley about north-west of Powderly, and extends to the south-west under the north-western portion of Bessemer. This synclinal has a big fault to the north-west of it as well as one along its south-east edge. It, in many places at least, is entirely within the strata of this formation or does not hold any overlying strata. It has however near its north-east end some as new strata as those of the (e) Red Mountain (Clinton) Formation that are in contact on the south-east or along the fault with the strata of this formation. The Cemetery Ridge or broken country of (c) Siliceous (Knox) Dolomite and Chert between the two belts of this formation is of itself a broad unsymmetrical synclinal with a steep north-west dip and often a big fault along its south-east edge. This south-east edge and its fault are not always exactly in line with the trend or strike of the rocks, and hence the branching off from them of the above narrow broken unsymmetrical synclinals with their faults. There are others of these narrow broken unsymmetrical synclinals. They account for the broken up nature of the strata along the north-west edge of this central belt. The strata of this central belt away from the north-west edge in many places have a serpentine strike and are in wrinkles. Its south-west dip, in a general way, increases towards the north-west.

The Hawkins Big Spring, in the N. E. ¼ of S. E. ¼ of S. 23, T. 18, R. 4 W., is in the edge of one of the narrow broken synclinals. The water of this spring has a deep blue color from its great depth.

The "*natural park*" is an extensive cedar glade in the

N. E. ¼ of S. 4, T. 19, R. 4 W. It is an old field that has grown up so thick in bushy red cedar as to make it difficult to get through it except along cut out ways. Its strata show in many naked ledges. The outcrops, thin bedded flatwood limestones, in the N. W. ¼ of N. E. ¼ of S. 8, T. 19, R. 4 W., are pushed over towards the north-west until their strike is in the shape of the end of an ellipse that points towards the north. The strata in their passage around the point of this bend are more or less broken up. Their general dip is towards the center of the ellipse. In the upper strata of this formation just to the south-east of Baylor, in the N. W. ¼ of S. 22, T. 20, R. 5 W., there is a ledge of massive breccia that is made up of angular pieces of the thin flatwood limestones in a calcareous matrix. This breccia has been seen also near Kimbrel Station and farther to the south-west.

(2) *Lower Silurian.* This group, from 2500 to 4000 feet thick, is of [a] *Pelham* [*Trenton*] *Limestones* and [c] *Siliceous* [*Knox*] *Dolomite and Chert.* Both of these formations occur in the Jones or Birmingham Valley, in Massey's Cove, and in the Cahaba Valley. The former covers about 30 and the latter about 110 square miles of the surface area of the county.

[c] *Siliceous* [*Knox*] *Dolomite and Chert.* This formation from 2000 to 3000 feet thick forms a broken irregular belt on each side of and one along near the center of the Birmingham Valley. The belt along the north-west edge of the valley, in its extension to the north-east, makes the broken central portion of Murphree's Valley. It is continuous to the south-west down into this county to near Five Mile Creek, and then, for over 20 miles to the south-west or to about Valley Creek, it is non-continuous or occurs only as an occasional short narrow patch, being for the most part engulfed in a fault. To the south-west of Valley Creek, it is continuous on down

into Tuscaloosa county. This belt from the county line or Village Springs to some 2 miles south-west of Haygood X Roads or along the big fault [Murphree's Valley and Little Basin Fault] as it crosses over from the south-east edge of the Murphree's Valley to the north-west edge of the Birmingham Valley or along the fault as it changes from an under-thrust to an over-thrust fault, is in contact on the south-east, along the fault, with the central belt of the same formation.

The fault for this distance is in the narrow valley, of the lower strata of the two belts, in which runs the Bessemer and Huntsville R. R. This north-west belt to the south-west of Haygood X Roads is a high sharp ridge that is known as *Gravelly Ridge*. The strata of this ridge are pushed over towards the north-west until they are more than vertical or have a dip towards the south-east. At its north-east end or along a branch at Haygood X Roads, its outcrops are in a gentle curve, being pushed farther over towards the north-west at the top of the ridge than at its foot, along the branch.

The location and extent of the patches of this belt between Five Mile and Valley creeks can be best seen from the State Geological Map. In the south-west end of one of these patches where cut through by the G. P. R. R. in the north-east edge of North Birmingham, there is some impure or cherty *halloysite*. This exposure is between two faults and hence its strata are badly broken up. It is in contact with Cambrian strata on the south-east and with Coal Measures on the north-west, though in a short distance to the north-east there comes in to the north-west of its strata, between it and the Coal Measures, first (e) Red Mountain (Clinton) strata and then also (h) Oxmoor Shales and Sandstones.

In this belt, over its lower strata, in the N. W. ¼ of S. W. ¼ of S. 29, T. 18, R. 4 E., there is considerable limonite scattered over the surface of a low knoll, and in the S. W. ¼ of S. 6, T. 19, R. 4 W., there is seemingly a still larger deposit of this ore. The belt between these two deposits of limonite is continuous, though its strata and those of the adjoining formations are badly broken up and faulted. Its northern edge is ragged or has projecting out from it finger points between ridges of [e] Red Mountain [Clinton] strata and [h] Oxmoor Shales and Sandstones. In places, its strata extend high up the sides of these ridges. These points are of course between faults, though the main fault, the Murphree's Valley fault, enters the Coal Measures in the N. E. ¼ of S. W. ¼ of S. 30, T. 18, R. 4 W., and to the south-west runs between the *Little Basin* and the *Big Basin* of the Warrior Coal Field.

This belt as it crosses Valley Creek is in contact along the fault on the north-west with [h] Oxmoor Shales and Sandstones. To the south-west of Valley Creek to the north-east end of McAshan Mountain, it is in contact on the south-east with strata of the same formation of the central belt of the Birmingham Valley, though it may be separated from them by a fault. For the whole length of McAshan Mountain, extending to the south-west of the county line, it is just to the north-west of a fault, being in contact on the south-east along the fault, with [g] Fort Payne Chert.

The central belt of this formation in the Birmingham Valley is a broken country of cherty ridges that occupy the trough of a broad unsymmetrical synclinal along the top of the broader washed out anticlinal that corresponds to the valley itself. This broad synclinal is by no means regular. Its strata are badly folded and faulted. It is crossed diagonally by minor anticlinals and faults which divide it up into smaller, though still broad synclinals. These minor anticlinals and faults have therefore a more north-ward and south-ward trend than the major ones. The upper or cherty strata of the belt or of the major synclinal have a couple of gaps in them, one to the north-west of East Birmingham and the other to the north-west of Bessemer, though the lower of its strata are continuous except across the latter or south-west of these gaps, or the one between the cherty ridges of the south-west end of the Cemetary Ridge and those of the north-east end of the Salem Hills. This gap is made by a sharp projecting bend in the north-west edge of the Cambrian strata, [b] Coosa [Flatwood] Shales and Limestones, that underlie Bessemer. The strata just outside of this bend, around its point, are badly broken up and faulted. Those within the point of the bend are also probably more or less faulted as they are badly contorted, though they can be traced in ledges around the point of the bend. Faults and an anticlinal in the Cambrian strata have doubtless helped to make this gap. To the north-east of this gap, the trend of the big synclinal or of the cherty ridges are not exactly in line with the general strike of the rocks of the valley but bears a little more west-ward and so there bears off from its south-east edge in places narrow unsymmetrical synclinals. These narrow synclinals are usually just to the north-west of faults and are in the line of extension to the south-west of the synclinals that cross diagonally the cherty ridges. One of these narrow unsymmetrical synclinals leaves the cherty ridges about north-west of East Lake and runs under Birmingham in the direction of old Elyton. An other one starts out from the cherty ridges about north-west of Powderly and runs under the northern part of Bessemer in the direction of the Salem Hills. The north-east end of the Salem Hills or of this belt to the south-west of the gap opposite Bessemer is therefore to the south-east of the south-west end of the Cemetery

Ridge or of the extension of this belt to the south-wes of the last named gap, and the north-east end of th Cemetery Ridge is to the south-east of the south-west extension of the south-west end of the cherty ridges to th north-east of the gap oppsite East Birmingham.

This central belt of [c] Siliceous [Knox] Dolomite and Chert to the south-west of the gap opposite Bessemer appears to be of a comparatively symmetrical synclinal, though it is cut by a traverse fault between the south–west end of the Salem Hills and the north–east end of the McAshan Mountain.

The synclinal to the south-west of this transverse fault, or the McAshan Mountain portion of it, is split by a big underthrust strike fault in which the north–west half of the synclinal is completely engulfed and its south-east half is sunken enough to carry the overlying formations as high up as [g] Fort Payne Chert. This belt therefore to the south-west of the Salem Hills is comparatively narrow or is only one-half the width of the original synclinal, being merely of its outcrops on the south-east side of the synclinal with overlying formations.

This central belt shows in many places, in both its upper and lower strata, a red brick dust colored massive breccia of a calcareous sandstone matrix with smooth angular cherty pebbles and some cherty fragments of a dull color. The breccia in the lower strata, as a general thing, are perhaps the more calcareous. They are usually, from the weathing out of the calcareous matter, porous and friable. They are however sometimes conglomerates of mere masses of rounded flint pebbles of about the size of mustard seed. Some few of them have a cherty look and irregular cherty seams. Some of them are micaceous. They are not always present, being more or less local in their occurrence, siliceous dolomites and limestones taking their places.

This central belt at its north-east end, or where its broad synclinal carries the overlying formations that run around the south-west end of the Blount Mountain, is forked. The south-east prong of the fork extends, as a gentle anticlinal, up into Clayton's Cove and the north-west one goes a short distance up into Murphree's Valley. Near the head of Clayton's Cove or in the S. ½ of N. W. ¼ of S. 8, T. 15, R. 1 E., in the upper strata of this formation, there is some beautiful limonite with fibres several inches long in some of the specimens. This south-east prong at and near the county line is in contact on the south-east with Red Mountain (Clinton) strata along a fault. To the south-west, however, there gradually comes in just to the south-east of the fault first Pelham (Trenton) Limestones and then the south-east belt of this formation. The central and south-east belts of this formation are now in contact for several miles to the south-west or to where the south-west extension of the anticlinal of Clayton's Cove becomes washed out into the narrow valley of Cambrain strata that to the south-west separates them. The central belt in the fork at its north-east end, or at the gap in East Red Mountain in the S. W. ¼ of S. W ¼ of S. 10, T. 15, R. 1 W. is in contact with Red Mountain (Clinton) strata. This is true however for only a very short distance, as the intervening (d) Pelham (Trenton) Limestones soon come in on each side of the gap. The fork that extends up into Murphree's Valley is very broken. It extends but a short ways up into that valley before it becomes engulfed in the fault on the south-east side of the valley. The strata along this fault are badly broken up, as can be seen in the railroad cut near Village Springs. They however to the south-west to Haygood X Roads form a rolling fertile valley of considerable, though irregular width. At a considerable elevation above this valley, on the top of a cherty ridge about in the N. W. ¼ of S. 32, T. 15, R. 1 W., there is an oval lime sink or pond, some 150 yards wide by 175 yards long, in which the water is said to always stand about the same level. It was supposed by the neighborhood people to be fed by a subterranean stream that flowed into it below the constant water level until a few years ago when this theory was exploded by the digging of a drainage ditch which, after draining the pond to a depth of 8 to 10 feet or to its own level, became perfectly dry.

In the cherty ridges in the eastern part of S. 5, T. 16, R, 1 W., there are some half-dozen or more limonite diggings. Some of these diggings have a fine showing of ore, though the most of them show but little ore, because, as it is believed, they were dug too far to the south-east. There is but little ore over the surface around these diggings. It is said to have been picked up and worked up in ante-bellum times in a bloomery on Turkey Creek below Haygood X Roads. This ore is mostly manganiferous and some of it is highly so. It is friable or breaks up into small irregular pieces. It shows more or less stratification.

The lower strata, to a thickness of 100 feet or more, around the south-west end of the cherty ridges to the north east of the gap to the north-west of East Birmingham, are of a very pure dolomite with a very deceptive look and feeling or with the appearance to both the senses of seeing and feeling of being both siliceous and argillaceous. It is for the most part a coarse grain semi-crystalline rock with a sugary look, especially on the weathered surfaces. It weathers unevenly. It is of cream and light asy gray colored strata and of strata that are banded and mottled by irregular interstratified seams and splotches of dark bluish gray and light gray colors. Strange to say, as a general thing, the lighter and purer looking rocks are the most impure. These rocks are now used extensively as a flux in the furnaces of the Birmingham district. They give a low silicon iron. They are also used some as a lining material in the basic open hearth steel furnaces of St. Louis. The two principal quarries in these rocks are known as the Spencer Quarry (Jefferson County Mining and Quarrying Company Quarry) and the J. W. Worthington & Co. Quarry (*Dolcito.*)

The *Spencer Quarry*, near Vanderbilt, Ala., or in the N. ½ of S. W. ¼ of S. 8, T. 17, R. 2 W., about ¼ mile long, shows a maximum face of about 30 feet of rock. There is however a considerable thickness of good rock below the floor of the quarry as well as above the top rock of the quarry. The lower 5 to 6 feet of the quarry is of the banded mottled rock. In the face of the quarry, there are several irregular concretionary looking patches with a pinkish clay filling small crevices and cavities in the rocks. This face will be added to, from both the dip of the strata and the rise in the hill, as the quarry is extended into the hill or ridge. Over the surface of the hill above the quarry, there is some little loose chert and breccia that rolled down from above.

The following analyses, furnished by Mr. Spencer, of the rocks of this quarry, are doubtless of representative stock-house samples:

	(1)	(2)	(3)
Silica	0.74	1.10	0.
Alumina	0.64	0.70	0

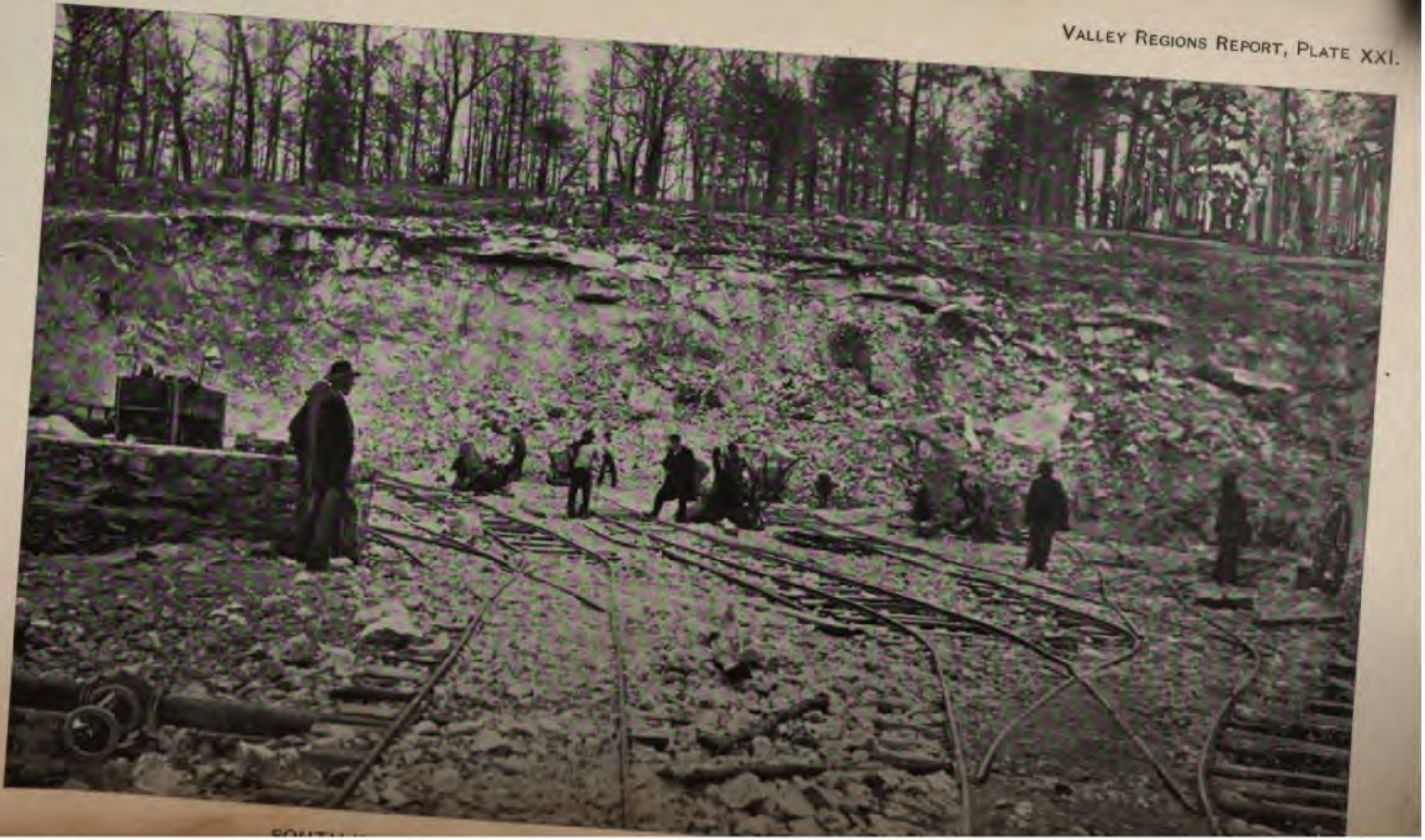
Carbonate of Lime	57.20	56.10	58.54
Carbonate of Magnesia	41.42	41.16	39.84
Oxide of Iron	——	0.30	——

(1) Analyst—N. B. Smith, Chemist Sloss Iron & Steel Co.

(2) Analyst—W. B. Phillips, Chemist Tenn. Coal, Iron & Railroad Co.

(3) Analyst— David Hancock, Chemist Sloss Iron & Steel Co.

The *J. W. Worthington & Co. Quarry* (*Dolcito*) in the same strata as those of the Spencer Quarry, is about 1 and ¼ miles farther to the north-east or is about in the S. W. ¼ of S. 5, T. 17, R. 2 W. This quarry is not so old as the Spencer Quarry though it is now being worked on a very extensive scale with the latest and most improved appliances, a wire ropeway being used as shown in the accompanying Plate XIX. This Plate is of the north-east end of the quarry and Plate XXI is of its south-west end. The quarry is something over 800 feet long and has a face of 20 or more feet of rock. Its floor and cover are also of good rock which extends up the hill to a great thickness over the top strata of the quarry. The face of rock will therefore increase as the quarry is extended into the hill or ridge both from the dip and the rise of the hill. The rock is partly of the banded or mottled kind. It is of very fine quality, as, according to Dr. W. B. Phillips, an average of 74 analyses representing from 2100 to 2400 car loads gave only 1.66 per cent. of silica. There is however in the upper or north-east end of the quarry, within a foot of each other, two irregular interstratified layers of sheets and nodules of pure white flinty chert from 0 to 2 inches thick that has to be picked out by hand. The quarry on Jan. 18, 1896, had a face of 17 feet. These 17 feet, at both ends of the quarry, were carefully sampled and analyzed



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t by foot by Dr. W. B. Phillips with the following re-
ts, commenceng at the bottom of the quarry:

(1) At the lower or south-west end of the quarry.

Silica in the 1st foot	0.88%
" " " 2nd "	0.87
" " " 3rd "	0.84
" " " 4th "	0.80
" " " 5th "	0.55
" " " 6th "	0.53
" " " 7th "	0.76
" " " 8th "	0.56
" " " 9th "	0.48
" " " 10th "	0.55
" " " 11th "	0.53
" " " 12th "	0.54
" " " 13th "	0.60
" " " 14th "	0.55
" " " 15th "	0.56
" " " 16th "	0.72
" " " 17th "	0.62

(II) At the upper or north-east end of the quarry.

Silica in the 1st foot,	1.14%
" " " 2nd "	1.13
" " " 3rd "	1.65
" " " 4th "	1.46
" " " 5th "	4.58
" " " 6th "	4.06
" " " 7th "	1.01
" " " 8th "	1.11
" " " 9th "	0.81
" " " 10th "	0.48
" " " 11th "	1.57

"	"	"	12th	"	3.87
"	"	"	13th	"	1.59
"	"	"	14th	"	1.19
"	"	"	15th	"	0.97
"	"	"	16th	"	1.06
"	"	"	17th	"	0.98

The above analyses show the south-west end of the quarry to be of very pure and quite uniform strata with an average of only 0.64% silica, and the north-east end of the quarry to be of much more siliceous and varying strata, though, as a whole, of quite pure strata, as its rocks carry an average of only 1.69% of silica. The 5th and 6th feet from the bottom show in their high silica that they carry the cherty layers.

To the north-east, in an outcrop on the L. & N. R. R. property, the upper 12 ledges, according to Dr. W. B. Phillips, were too siliceous to be analyzed, but the next underlying 17 ledges, with a combined thickness of 129 feet, with the exception of one ledge 2 feet thick, were analyzed by him with following results:

Silica	in	ledge	13,—10	feet	thick,	3.04%
"	"	"	14,— 6	"	"	4.48
"	"	"	15,—10	"	"	1.60
"	"	"	16,— 2	"	"	4.80
"	"	"	17,—10	"	"	2.88
"	"	"	18,— 6	"	"	1.62
"	"	"	19,— 8	"	"	2.88
"	"	"	20,— 7	"	"	0.39
"	"	"	21,— 4	"	"	1.81
"	"	"	22,— 8	"	"	1.68
"	"	"	23,— 2	"	"	too siliceous to be analyzed
"	"	"	24,— 6	"	"	0.51
"	"	"	25,— 5	"	"	1.28

"	"	"	26,— 8	"	"	4.40
"	"	"	27,— 3	"	"	2.62
"	"	"	28,— 9	"	"	1.61
"	"	"	29,—11	"	"	1.64

The above analyses give an average of 2.27% of silica for the 127 feet of rock.

The different ledges of an outcrop of 116 feet of rock still farther to the north-east or on Five Mile Creek nearly two miles north-east of Dolcito, gave, according to Dr. W. B. Phillips, the following analyses, commencing at the top of the outcrop:

(1)	Silica in first	4	feet	3.36%
(2)	" " next	6	"	6.37
(3)	" " "	6	"	4.01
(4)	" " "	5	"	2.21
(5)	" " "	5	"	1.19
(6)	" " "	8	"	1.22
(7)	" " "	8	"	3.91
(8)	" " "	2	"	4.04
(9)	" " "	3	"	3.63
(10)	" " "	2	"	5.76
(11)	" " "	4	"	1.26
(12)	" " "	4	"	0.96
(13)	" " "	5	"	1.28
(14)	" " "	3	"	1.48
(15)	" " "	4	"	1.68
(16)	" " "	3	"	1.70
(17)	" " "	3	"	2.42
(18)	" " "	2	"	2.04
(19)	" " "	3	"	3.89
(20)	" " "	5	"	3.66
(21)	" " "	3	"	3.72
(22)	" " "	3	"	1.69

(23)	"	"	"	2	"	..............6.34
(24)	"	"	"	3	"	..............1.53
(25)	"	"	"	5	"	..............2.31
(26)	"	"	"	4	"	..............3.74
(27)	"	"	"	4	"	..............6.91
(28)	"	"	"	3	"	..............7.28
(29)	"	"	"	4	"	..............2.86

A good average sample of the whole 116 feet of
above outcrop, made up of the different ledges in th
act proportion of their respective thicknesses, gav
cording to Dr. W. B. Phillips, the following analysi

Silica.	Oxide of Iron.	Alumina.	Lime.	Magnes
3.26%	0.78%	0.74%	32.16%	17.71

The lime (32.16%) is equivalent to 57.43% car
ate of lime, and the magnesia (17.71%) is equivale
37.20% carbonate of magnesia.

An average sample of the above dolomites, mad
of samples from the Spencer, May, Forrest City,
Vanderbilt properties, and from the north Birmin
Waterworks Canal, analyzed by Mr. J. W. Mills, c
ist of Vanderbilt S. & I. Co., gave, according to M
A. Meissner, 1.00% of silica and 1.05% of alumina.

The massive breccia at the top of this formation m
an exceptional fine exposure on a knob in the c
ridges in the S. W. ¼ of N. W. ¼ of S. 25, T. 16, R.
It is here a mass of smooth or water worn angular c
rocks from the size of a small pebble to that of a
barrel, with just enough matrix to hold them toge
The matrix is a calcareous ferruginous material.
also carry some large angular pieces of the brick
colored conglomerate with very small rounded flint
bles, that belong at the top of the formation.

form some bluffs of 50 feet in height that have rock-houses under them and pockets or holes in them from the falling out of the cherty pebbles and rocks. They are cut up by vertical joints, running north-east and south-west along which the rocks split off and form the vertical bluffs. They appear to be about level from the fact that they are doubtless on the top of a wave. They make other fine exposures in this neighborhood.

The coarse breccia at the bottom of the formation form a bluff on Five Mile Creek in the S. W. ¼ of S. W. ¼ of S. 25, T. 16, R. 2 W. Its matrix is cherty. It also has irregular cherty seams or splotches. Its dip is about 50 deg. to the north-west. Some of the sugary or siliceous dolomites between these two sandstone breccias are in places a coarse dolomitic breccia with large angular fragments of its own rocks.

Over the cherty ridges along the south-east edge of this belt, from at least opposite or north-west of East Lake to the south-west end of Cemetery Ridge or to the gap in the cherty ridges to the north-west of Bessemer, there is more or less lenticular or red iron ore. This ore, with the exception of a few places in the Cemetery Ridge, is in small loose water worn pieces that lie scattered over the surface. It is much more abundant in places or spots than others. It is most probably for the most part the last remnants of the (e) Red Mountain (Clinton) Formation that once occupied the trough of this unsymmetrical synclinal, though fossils (Clinton) have been found in it in only one place. In several places, it is believed to be of a local seam that occurs at the bottom of the overlying Pelham (Trenton) Limestones. It is mostly of good quality.

The conglomerate with small flint pebbles at the top of this formation looks very much like the conglomerate of the (e) Red Mountain (Clinton) Formation.

The narrow unsymmetrical synclinal that branches off from the broken central belt of cherty ridges about north-west of East Lake and runs under Birmingham and old Elyton does not carry the cherty strata of this formation much to the south-west of the Woodlawn Cemetery. Still farther to the south-west, to where it runs into the south-east belt of this formation, it is mostly a low broad ridge of deep red loam, doubtless from the disintegration of the lower rocks of this formation, with in places some few cherty chips and angular fragments and some patches of the broken up sandstone breccia that belongs at the bottom of the formation. It may be that in places this formation is entirely removed from over the narrow synclinal, which, in these gaps, is entirely within the underlying Cambrian strata, (b) Coosa (Flatwood) Shales and Limestones.

The strata of the Cemetery Ridge, at its north-east end at least, are all broken up, as can be seen in the cut of the North Birmingham Dummy Line. They are exposed in this cut to a thickness of about 35 feet and are in waves within waves with a north-east and south-west trend. The cut as a whole is of an anticlinal that is crumpled up into waves and that is within the broad unsymmetrical synclinal of the Cemetery Ridge or of the central belt of this formation. Its strata in places where badly broken up are more or less faulted. The top strata are thin cherty seams; the middle ones, making the major depth of the cut, are a flaggy coarse grain calcareous sandstone; and the bottom ones are a sandy conglomerate and a calcareous sandstone. The sandstones are leached until they are porous and friable. Some of the conglomerates have smooth rounded cherty pebbles as large as a hen-egg. Under the conglomerates or at the bottom of the strata here exposed, there is a stiff yellowish clay in regular stratified seams with a general dip of about 30 deg. to the north-west, though in wrinkles and waves.

The lenticular or red ore has been seen in several places *in situ*, though badly broken up, in the cherty ridges of the south-west half of the Cemetery Ridge. These bedded strata are all on high points and appear to be lying right on top of the rocks of this formation, though in one place, on top of the high ridge made by the narrow unsymmetrical synclinal that branches off from the Cemetery Ridge about north-west of Powderly, Clinton fossils have been found in them. The cherty ridge of this narrow unsymmetrical synclinal is about two miles long, extending to the south-west to within about ¼ mile of Walnut Grove Church, though its bottom dolomites extend much farther to the south-west. This narrow synclinal is bounded on the south-east by a big fault that brings its strata in contact with (b) Coosa (Flatwood) Shales and Limestones, and that engulfs the greater part and in places the whole of its south-east half. Some of its loose cherty nodules are oolitic and some of them have geodes that are lined with beautiful quartz crystals. It has near its north-east end, or just before it runs into the Cemetery Ridge, some of the breccia with angular cherty pebbles.

Just to the north-west of the above narrow unsymmetrical synclinal, there is another similar synclinal that at its north-east end, or just before it runs into the cherty ridges of the Cemetery Ridge, carries only the lower dolomites of this formation, though farther to the south-west it has a low ridge of cherty gravels and red loam. Between these two narrow synclinals, there is a broken or faulted narrow unsymmetrical anticlinal that farther to the north-east, between the high chert ridge of the south-east narrow synclinal and those of the Cemetery Ridge, is washed out into a narrow valley with outcrops along the Birmingham and Bessemer Dummy Line of (a) Montevallo (Variagated) Shales and Sandstones just to the north-west of a fault.

The Cemetery Ridge, near the southeast edge in S's 12 & 23, T. 18, R. 4 W., has many lime sinks. One of these sinks extends down to water and hence it is known as the "natural well." This ridge has a deposit of limonite, seemingly small, on the dummy line along its south-east edge in the S. E. ¼ of S. W. ¼ of S. 27, T. 18, R. 4 W. The ridge ends on the south-west in a rolling country of red loam that has been derived from the disintegration of its bottom strata. It may be that these bottom strata were elevated by a cross or transverse anticlinal that helped to divide the cherty ridges of the Cemetery Ridge from those of the Salem Hills. Near the north-east edge of these red lands, in the N. E. ¼ of S. W. ¼ of S. 21, T. 18, R, 4 W., there is an isolated patch, called the "burst up," of the sandy breccia at the bottom of this formation. These rocks are badly broken up and are full of angular flint pebbles, with smooth or rounded edges, that are evenly distributed through them. The pebbles are mostly small, though some of them are as large as beans. Some of these rocks have a scaly appearance and look as if they had been subjected to great pressure.

The Salem Hills end on the north-east in rolling lands of deep red loam that extend to the north-east to the edge of Bessemer. Their cherty strata stop on the north-east just across the creek (Hall's) from Old Jonesboro. The outcrops higher up this creek show that the strata of the Salem Hills, at their north-east end at least, have no regular dip and strike or that they are very badly broken up. This is probably due to the faults around the outer edge of the sharp north-west bend in the Cambrian strata between the Cemetery ridge and the Salem Hills. To the south-west of this north-east end, the Salem Hills appear to be of a symmetrical synclinal with comparativly gentle dips. On the north-west side of these hills, at the Salem Hills' Springs, a group of beautiful springs, there is an outcrop of a fine grain dolomite that takes a very good polish. It is of a light yellowish gray color and somewhat resembles a lithographic stone in texture. It has however a dark streak with iron pyrites. The lower rocks of this formation form to the north-west of the Salem Hills some beautiful rolling lands of red loam, fine farming lands though now lying out in old fields and partly grown up in old field-pines like much of the fine farming lands of the State that belong to large companies. These lower rocks are finely exposed along the Five Miles Creek that ends the Salem Hills on the south-west or runs between these hills and the McAshan Mountain. These outcrops, though in sharp wrinkles or waves in places, show the Salem Hills to be of a comparatively symmetrical synclinal trough. Some of them are covered with a growth of red cedar. The cross or transverse fault that cuts off or puts a stop to the McAshan Mountain at its north-east end runs along near this creek.

The portion of this belt to the south-east of the McAshan Mountain appears to be perfectly regular. It, as has been stated, is merely the outcrops of this formation, with a gentle north-west dip, on the south-east side of a synclinal with overlying strata. In it, there are some fine big springs, as the Roup Springs and the Bucksville Springs. Some of its upper strata are of a typical siliceous dolomite, as shown by the following analysis by Mr. J. L. Beeson of an average sample, dried at 110 deg. C., of an outcrop near its north-east end or in the S. W. ¼ of S. W. ¼ of S. 36, T. 19, R. 5 W.

Carbonate of Lime	46.445
Carbonate of Magnesia	34.239
Silica	19.710
Alumina and Ferric Oxide	1.800

The continuation or this central belt to the south-west, down into Tuscaloosa county, is a rolling country of red loam with a great deal of limonite, overlying Coosa (Flatwood) Shales and Limestones.

The south-east belt of this formation in the Birmingham Valley is, as has been stated, engulfed in a fault at its north-east end up in Clayton's Cove. It however to the south-west soon begins to gradually set up on the south-east side of the fault and is then continuous through the county. In this belt at the foot of a chert ridge in the S. W. ¼ of S. E. ¼ of S. 3, T. 16, R. 1 W., there is a deposit of white potter's clay. This clay has been dug into to a depth of about two feet and it forms the bed of a branch some five feet lower than the bottom of the test pit, so there is no telling how thick it is. It carries some very hard, though pure, nodules of halloysite. Over it, there is a light mulatto clay that shows about two feet of its thickness in the test pit. Over the top strata of this belt opposite the Edward's Gap of East Red Mountain in the S. E. ¼ of S. E. ¼ of S. 19, T. 16, R. 1 W., there is a seam of red ore that may belong at at the top of this formation or bottom of the overlying am (Trenton) Limestone.

This belt shows in many places the sandy breccia in both its top and bottom strata. That in its top strata in an outcrop at Gate City is interstratified with a sandstone that on the weathered outcrops is friable and shaly. The two form here an outcrop from 50 to 60 feet thick. The lower dolomites and limestones of this formation are exposed to a thickness of about 100 feet in a bluff covered with cedar in the S. E. ¼ of N. E. ¼ of S. 15, T. 16, R. 2 W. The outcrops over the Avondale Spring carry nodules of black flinty chert and streaks of calcite. Some of the loose chert around them is full of cubical cavities while some of it is mere masses of oolitic grains. These outcrops form a bluff with a cave that doubtless leads back to the subterranean stream which comes to light in the big spring at the foot of the bluff. This belt opposite Birmingham is especially broad and carries a great deal of beautiful concretionary chert Along with breccia in the top strata in the S. E. ¼ of S. 16, T. 18, R. 3 W., there is some red colored limonite. Here and to the south-west of here, this belt is of a broken cherty ridge with to the north-west of it two low rounded ridges of red loam that are separated from each other and from the broken cherty ridge by narrow shallow valleys. The north-west of the two low ridges of red loam carries the bottom breccia of the formation. This breccia, however, like the top one, occurs only in patches. This north-west ridge has in it in places, as under the Montezuma Hotel, Bessemer, a hard flinty looking sandy shale that belongs in the top strata of the (b) Coosa (Flatwood) Shales, Upper Conesauga. The other low ridge of red loam has over it, especially over its sloping south-east side, a good deal of loose lenticular or red iron ore, in small smooth or water worn pieces. This ridge where cut through by the B. B. & B. R. R. south-west of Jonesboro has in its red loam seams from ¼ to 1 inch thick of hard bony looking bluish chert, often flinty, that are in wrinkles and small waves with a north-east and south-west trend and a general south-east dip. This flinty chert has come from the weathering of banded limestones and dolomites. The broken cherty ridge to the south–east has over it also some lenticular or red iron ore, though the pieces appear to be, as a general thing, somewhat larger and not so smooth or rounded as those over the above low ridge. The strata of this cherty ridge are also in waves and wrinkle with a north–east and south-west trend and a general dip towards the south-east, as can be seen in the cut of the B. B. & B. R. R.

The above lenticular or red iron ore, as well as that over the central belt, is believed to have come for the most part from the (e) Red Mountain (Clinton) formation that once extended over the Birmingham Valley.

The strata of this south-east belt are well exposed along Roup Creek, the line between Jefferson and Tuscaloosa counties.

Massey's Cove in the north-east part of the county is a denuded unsymmetrical anticlinal valley with a fault along its south-east edge. It is almost wholly, or with the exception of the very small portion to the south-east of the fault, of the gentle north-west slope of the anticlinal with a general dip towards the north-west. It is principally of the upper strata of this formation in which the breccia is highly developed. This breccia forms "*the falls.*" *The falls* are on a small creek in the N. E. ¼ of N. E. ¼ of S. 5, T. 16, R. 1 E. They are of three step-like ledges and hence of three water falls when the water is low or when it falls from one ledge to the next one, and only one water fall when the water is high or when it clears or jumps over the two lower steps or projecting ledges. The top step or fall is about 12 feet high and the other two are about 15 feet each in height. The rocks of the top step or bench are not so hard and massive as those of either of the other two, and those of the middle step or bench are not so hard massive as those of the bottom one. Those of the bottom bench, of a sandstone matrix with angular pebbles and nodules of chert from the size of the fist down, are very massive and hard. The lower rocks of the middle bench have been scooped out into a *rock-house* or sheltered place. Over the top bench or the bed of the branch above the falls, there is a hard cherty sandstone, of from 25 to 30 feet thick, with an occasional pebble. This rock has seams or strata in it that will make fine millstones. The strata hereabouts are in two sets of waves, one with a north-east and south-west trend and the other with a north-west and south-east trend Over the low ridge to the north-east of *the falls*, there are loose boulders of almost house-size from the lower bench of *the falls*.

These breccia crop out as bluffy ledges in the S. E. ¼ of S. W. ¼ of S. 32, T. 15, R. 1 W. To the north-east, they show in places as unbroken arches over the waves with the north-east and south-west trend. To the south-east of the ridges with these breccia or between them and the high ridge of Red Mountain (Clinton) and Sub-carboniferous strata on the south-east side of the cove, there is a beautiful valley of red loam, from the lower rocks of this formation, that is in places ½ mile wide. To the south-east of the valley, in places along the fault, there are patches of the cherty strata of this formation that belong on the south-east side of the anticlinal. These strata are in contact on the south-east along the fault, with the (e) Red mountain (Clinton) formation in the N. E. ¼ of N. W. ¼ of S. 34, T. 15, R. 1 E., and the (g) Fort Payne Chert in about ¼ mile to the south-west or near Stevens' Switch. They extend high up on the ridge of the above two formations in the S. E. ¼ of S. E. ¼ of S. 5, T. 15, R. 1 E.

A little farther to the south-west, as the cove gets very narrow, the fault gradually crosses over to the north-west side of the cove, and hence this formation down in the narrow point of the cove is to the south-east of the fault. It is here of broken cherty ridges that are doubtless badly faulted.

The Cahaba Valley belt is a broad broken country that covers the greater part of the north-west half of the valley. It is of the gently dipping outcrops of the south-east half of the valley anticlinal, the north-west half, with its steep dips, having been engulfed in the big fault (Rome and Cahaba Fault) that bounds the valley on the north-west. This belt is separated from the fault by a narrow belt of Cambrian strata, though in one place, in the S. W. ¼ of S. 24, T. 17, R. 1 W., there is a small patch of this and overlying formations to the north-west of the fault or between two faults. The strata of this belt are in waves with a north-east and south-west trend, as can be seen along the East Fork of the Cahaba River.

Pelham (*Trenton*) *Limestones*. This formation from 600 to 1200 feet thick covers about 30 square miles of the surface area of Jefferson County. It makes a narrow belt on both the north-west and south-east side of the Birmingham Valley and in the north-east and south-west parts of the county one also in the central part of this valley. These outcrops of the central part of the valley are of the north-east and south-west ends of a central belt of the broad unsymmetrical synclinal of the valley that once extended through the county from north-east to south-west. This formation also forms a narrow belt on the north-west side of Massey's Cove and quite a broad one on the south-east side of the Cahaba Valley.

The belts of the Birmingham Valley form over two-thirds of the area or about 22 square miles. The north-west belt of this valley is in places engulfed in faults. It is, however, continuous from the county line on the north-east to the south-west to Tarrant's Gap in the S. E. ¼ of S. 29, T. 16, R. 2 W., with the exception of about ½ mile along Turkey Creek just north of Haygood's X Roads where it appears to be engulfed in a fault. From Tarrant's Gap to the south-west of Valley Creek, it is engulfed in faults with the exception perhaps of one or two small isolated patches. From just south-west of Valley Creek to the south-west to beyond the county line, it is continuous. The outcrops of this north-west belt are so badly covered up that they show in but comparatively few places. They are in places bent over towards the north-west until they have a south-east dip. The variagated limestones near the bottom of the formation are to be seen in the S. E. ¼ of N. W. ¼ of S. 35, T. 19, R. 5 W. This outcrop, on being polished, makes a very pretty rock.

The south-east belt of the Birmingham Valley is continuous through the county from north-east to south-west with the exception of a short distance at the county line across the head of Clayton's Cove and perhaps for a short distance opposite the mouth of this cove. The visible outcrops of this belt are very numerous and many of them are fine exposures. They usually form the greater part of the steep north-west side of East Red Mountain and a narrow valley along its north-west foot

In some of the gaps and low places, they form also the crest of the mountain. The Sloss Quarry at Gate City is in the upper strata of this belt. The limestones are said to be faced up to a thickness of 110 feet in this quarry and a bored hole on the south-east side of Red Mountain is said to have been in these limestones for about 600 feet. This hole would make with the dip a blount acute angle. These limestones here however are over 500 feet thick and at least half of this thickness is of *good* rock. The limestone of the quarry is said to analyze from 95 to 98% of carbonate of lime with the exception of one ledge, about 36 inches thick, that carries about 85% of carbonate of lime. This quarry has furnished many thousands tons of rocks to the furnaces of the Birmingham district. The arrangements here for getting out the rock in the largest quantity and at the smallest possible cost seem to be almost perfect. Hundreds of tons of rock can be thrown down at one blast and all of the machinery in use is of the latest and most improved patterns. The immense crusher, on the side of the mountain just below the quarry, is over the railroad track and from it the crushed rock fall immediately into the cars to be carried away to the furnaces. An average sample of 30 to 40 of the small pieces picked up from under the crusher, on being dried at 100 deg. C., gave the following analysis:

Carbonate of Lime	91.164
Silica	5.704
Ferric Oxide	1.867
Phosphoric Acid	0.153

The following analysis of "Gate City Limestones," from this quarry, made by Mr. J. W. Mills, Chemist of Vanderbilt S. & I. Co., are from an article by C. A.

Meissner, published in the Proceedings of the Alabama Industrial and Scientific Society, Vol IV, No. 1:

Analysis,	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lime......	——	50.44	——	51.97	51.84	——	50.75
Silica......	2.37	2.43	3.03	3.29	3.65	3.74	3.82
Alumina & Ferric Oxide	——	3.30	——	1.49	0.91	——	1.96

The following analysis of "Red Mountain Limestones," from the same article as the above, and made by the same chemist, are also of the limestones of this formation and belt:

Analysis,	(1)	(2)
Lime......................	53.92	49.42
Silica......................	1.78	4.47
Iron......................	——	2.68

An outcrop of the upper strata of this formation along the top of East Red Mountain about opposite the old McIlwain or Irondale furnace, or in the S. E. ¼ of S. 28, T. 17, R. 2 W., is for the most part of hard fine grain limestones, though some of them are granular masses of either calcite crystals or fossils. They are of light and dove gray colors. The light colored rocks are smoothly weathered, while the others are rough and scaly on the weathered surfaces. These limestones have been burnt some into lime and were used some as a flux in the old McIlwain or Irondale furnace. The visible outcrop here is from 60 to 70 feet thick. Farther to the south-west, the visible outcrops are in places, as along the Birmingham and Columbiana road, 100 or more feet thick. The variegated limestones near the bottom of the formation show along the foot of East Red Mountain in the N. W. ¼ of

S. 11, T. 19, R. 4 W. They are here tinged greenish and in places are highly ferruginous. They are hard compact fine grain argillaceous limestones that would doubtless take a good polish.

The central belt of the Birmingham Valley, as it now is, is of a broad belt that extends as a loop around the south-west end of Blount Mountain and as a narrow belt along the south-east side and foot of McAshan Mountain. In the above loop, the limestones show to a great thickness. They extend almost across the head of Clayton Cove and out from the Red Mountain on the north-west side of this cove as spurs with high mountainous knobs. These spurs and knobs are usually covered with red cedar and hence the highest of them are known as the *Cedar Mountains*. Their strata in places are in two sets of waves with respectively north east-south west and north west-south east trends. The variegated limestones, with often a greenish tint, near the bottom of the formation are to be seen here in many places. They are often a breccia with small sharp angular flinty or cherty pieces that are frequently of a greenish color. The dull red rocks are called marbles. The high cone-like mountains, principally in S. 23, T. 15, R. 1 W., are the ones that are commonly called the *Cedar Mountains*. The two highest and most north-western of these mountains have a thin capping of the (e) Red Mountain (Clinton) Formation, and the most south-west ones have a base of (c) Siliceous [Knox] Dolomite and Chert. The variegated rocks at the bottom of the formation have just under them in places a calcareous sandstone. This sandstone, as broad flagstones, form the whole bed of the road in the south-west corner of N. W. ¼ of S. 23, T. 15, R. 1 W. They are here overlaid by a stratum about 18 inches thick of a ferruginous pinkish or dull reddish argillaceous limestone that on weathering becomes more or less shaly.

This formation looks as if it is engulfed in a fault at the gap through Red Mountain in the S. E.¼ of S.10, T.15, R. 1 W., where loose rocks of the [c] Siliceous (Knox) Dolomite and Chert Formation are in contact with the (e) Red Mountain (Clinton) Formation. It is however highly exposed near and on each side of this gap. It is continuous from near this gap for a mile or so up into Blount county to where it becomes engulfed in the big fault on the south-east side of Murphree's Valley.

The narrow belt of this formation along the south-east side and foot of McAshan Mountain appears to be perfectly regular. It shows but few outcrops.

This formation is well exposed along the north-west edge of Massey's Cove. On the south-east side of this cove, with the exception perhaps of at the mouth and head of the cove, it is engulfed in a fault. Outcrops on the north-west side of the cove in the S. E. ¼ of S. W. ¼ of S. 16, T. 15, R. 1 E. make some cedar glades and a water-fall about 50 feet high. These outcrops on the north-west side of the cove stop on the south-west in a high mountain in the S. W. ¼ of S. 5, T. 16, R. 1 E., at the end of an eastern bend in the belt. This high point or mountain is where the fault, after having gradually crossed over from the south-east side of the cove, strikes the north-west side of the cove. To the south-west of here, the cove is very narrow and broken, especially on its north-west side. This formation however shows in one place on the north-west side, in the N. E. ¼ of S.W. ¼ of S. 7, T. 16, R. 1 E., and doubtless occurs all along on the south-east side of the cove.

In the Cahaba Valley, this formation forms, on the south-east side of the valley, a broad belt that extends from north-east to south-west across the south-east edge of the county. It occurs on the north-west side of this valley in only one place, between two faults in the S.W. ¼ of S. E. ¼ of S. 24, T. 17, R. 1W., being elsewhere engulfed in a big fault. The belt on the south-east side of the valley includes nearly all of the steep north-west side of Little Oak Mountain and a valley from ¼ to ½ mile broad along the north-west foot of this mountain.

(3) *Upper Silurian, (e) Red Mountain (Clinton) Formation.* This formation from 400 to 650 feet thick does not cover over 25 square miles of the surface area of Jefferson county, yet, from an economic standpoint, it is only second to the Coal Measures in importance of the formations of the county. It occurs on both sides of the Birmingham Valley and Massey's Cove, and also, to a slight extent, on both sides of the Cahaba Valley, but it is mainly the belt on the south-east side of the Birmingham Valley, or East Red Mountain with its vast amount of hematite that gives to it its great importance. It also forms a belt in the north-east and south-west parts of the county near the center of the Birmingham Valley that is of the north-east and south-west ends of a central belt that once occupied the broad unsymmetrical synclinal of the valley and that once extended through the county from north-east to south-west. Besides and between these two ends, there still remains of the central belt one or more small isolated patches and a great deal of loose ore over the surface in small smooth or water worn pieces.

The northwest belt of the Birmingham Valley is continuous from the county line on the north-east to the south-west to Tarrant's Gap in the S. E. ¼ of S. 29, T. 16, R. 2 W., with the exception perhaps of a short gap on

Turkey Creek just north of Haygood X Roads. From Tarrant's Gap to the south-west to just below Valley Creek, this belt is for the most part engulfed in faults, in some places wholly and in other places partly. Where not entirely engulfed, it usually exists as detached short narrow patches of crushed strata along the faults. From just below Valley Creek on to the south-west to the county line, it is continuous.

This north-west belt or "*West Red Mountain*" near the county line or about opposite Village Springs, is believed to have in it three seams of ore about as in the following section :

Ideal Section of West Red Mountain Opposite Village Springs.

(7) Sandstones, Shales.
(6) *Ore:* soft and good, from . . . . . . 2 ft. 6 in, to 3 ft. 6 in
(5) Limestones, Shales; from . . . . 20 ft. 0 in. to 30 ft. 0 in.
(4) *Ore;* a ferruginous limestone,
from . . . . 3 ft. 0 in to 4ft 0in.
(3) Limestones, Shales, Sandstones; about . . 50 ft 0 in.
(2) *Ore*, Sandstones, Shales: the ore is nothing more than a frailable coarse grain ferruginous sandstone on the outcrop, it has partings of sandstones and shales with a combined thickness of about the same as the ore; it is known as the *big seam*, from 50ft. 0in. to 75ft. 0in.
(1) *Pelham (Trenton) Limestones.*

The dip is from 30 deg. to 40 deg. to the north-west. The ore [2] is almost black on the outcrop. It is believed to be a ferruginous sandy limestone below the point of weathering. Its outcrops frequently form a bench or a line of knolls along the foot of the mountain. Its outcrop also in the N. W. ¼ of S. 9, T. 15, R. 1 W., is soft and friable and almost black. It is here a mass of loosely coherent black ferruginous coarse sandy gains.

The lower strata of this formation, in the gap of Self

Creek in the N. W. ¼ of S. W. ¼ of S. 9, T. 15, R. 1 W., have a dip of about 70 deg. to the north-west. From here on to the south-west to Haygood X Roads, there has not been seen any ore of the best quality in *West Red Mountain*. About the best that has been seen crops out in the S. E. ¼ of N. W. ¼ of S. 20, T. 15, R. 1 W. This outcropping has been dug into in a couple of places. In the first or north-eastern of these two test pits, near the center of the *forty*, there shows a ledge of *hard ore* to a thickness of about 75 inches. It is coverered by debris and is most probably of the seam (4) of the above *ideal section*. Its dip is about 45 deg. to the north-west. In the second or south-west test pit, some 150 yards to the south-west, and low down on the side of the mountain or from 75 to 100 yards from the top of the mountain, there is the following section:

Section of Test Pit in the S. E. ¼ of N. W. ¼ of S. 20 T. 15, R. 1 W.

(13)	Debris: soil.	
(12)	*Ore*: sandy, in large grains	5 ft. 0 in.
(11)	Shale: yellowish, only in places	0 to 0 ft. 1 in.
(10)	*Ore*	2 in.
(9)	Shale: yellowish, from	2 to 3 in.
(8)	*Ore*	1 ft. 4 in.
(7)	Shale, *Ore*; the shale is yellowish and carries the ore only in places, in streaks	6 in.
(6)	*Ore*	1 ft. 2 in.
(5)	Shale: yellowish, from	12 ft. to 14 ft. 0 in.
(4)	*Ore*: soft, scarlet color	1 ft. 0 in.
(3)	*Ore*, Shale; in alternate streaks, the ore is sandy	1 ft. 0 in.
(2)	*Ore*, Shale; the ore is soft and is of black ferruginous coarse sandy grains, it has in it the shale as several thin partings, could't see its full thickness, though visible to a thickness of	7 ft. 0 in.
(1)	Debris.	

The strata from (2) to (4) inclusive of this last sectio or second pit are of a different seam, the *big seam.* The other or first test pit does not show the bottom part, [8] of the last section, of the top seam. Average samples of this top seam as exposed in these two test pits, on being dried at 100 deg. C. gave the following analyses:

	(1)	(2)
Ferric Oxide	56.571	63.323
Silica	37.078	31.609
Phosphoric Acid	0.527	0.530

(1) From first or north-east test pit. Labled: A well leached sandy ore with rounded siliceous grains.

(2) From second or south-west pit. Labled: A leached ore with some good size rounded siliceous grains. Analyst, J. L Beeson.

Some ¼ mile to the south-west, there are outcrops of two seams of ore from 35 to 40 feet apart. These outcrops are poor or do not show up the ore well. They are about as in the following section :

Outcropping in the S. W. Corner of S. 20, T. 15, R. 1 W.

[6]	Soil, *Ore;* the ore is dirty, it is in several streaks, of from 4 to 5 inches each in thickness, in the soil, about	10 ft. 0 in.
[5]	*Ore;* good	1 ft 4 in.
[4]	Debris	25 to 30 ft. 0 in.
[3)	Shale, *Ore;* the ore is soft and dirty, and consists of only a few streaks in the shale, visible about	10 ft. 0 in.
(2)	*Ore;* soft, friable, black, ferruginous sandy loam, about	6 ft. 0 in.
(1	Debris.	

In this outcropping, (5) and (6) are of one seam and (2) and (3) are of an other. The dip here is about 30 deg. to the north-west. The upper of these two ore seams in an other set of test pits to the south-west shows up only as some loose ore through about 18 inches of loam.

Still farther to the south-west, about ½ mile or some 200 yards north of Blackburn's Mill, in the N. E. ¼ of S. E. ¼ of S. 30, T. 15, R. 1 W., as the break in the strata along Turkey Creek just north of Haygood X Roads is approached, the ore ridge or West Red Mountain has a backbone of a ledge of hard sandstone. This ledge is bent around until its strike here is about north and south. In this break or gap in West Red Mountain along Turkey Creek, the strata are badly twisted about and crushed and broken up, and are not likely continuous across the break or gap, but of this I can't be certain as they are so badly covered up. Over the point or spur of West Red Mountain as it is curved around at the north-east end of the break, or in the S. W. ¼ of N. E. ¼ of S. 39, T. 15, R. 1 W., there is a great deal of loose ore that comes from the outcrops of the two seams which are here about 12 feet apart. This loose ore is of much better quality than the ore of the following outcrop in the race under the Blackburn Mill in the N. E. ¼ of S. E. ¼ of S. 30, T. 15, R. 1 W.

Outcropping under Blackburn's Mill in the N. E. ¼ of S. E. ¼ of S. 30, T. 15, R. 1 W.

(9)	*Ore*; behind mill wheel, reported to be about	9 ft. 0 in.
(8)	Shale; yellowish, from	3 to 4 ft. 0 in.
(7)	*Ore*, Shale; about	1 ft. 0 in.
(6)	*Ore*; good	1 ft. 3 in.
(5)	*Ore*, Shale; the shale in streaks in the ore	10 in.
(4)	*Ore*; from	3 to 4 ft. 0 in.
(3)	Shale; about	3 ft. 0 in.
(2)	*Ore*; about	2 ft. 6 in.
(1)	Shales, Sandstones; in race and creek for 75 to 80 yards.	

The ore of this outcropping is principally a fine grain siliceous or sandy ore, though some of it is seemingly of very good quality. An average sample of it, dried at 100 deg. C., gave the following partial analysis:

Ferric Oxide	39.333
Silica	48.638
Phosphoric Acid	0.724

The above strata are pushed over until those under the mill have a dip of about 85 deg. to the south-east and those in the creek a dip of about 80 deg. to the east.

In the break or gap, the strata are badly covered up by debris, They, or some sandstones of this formation, show however as they cross the creek in the N. W. corner of the N. W. ¼ of S. E. ¼ of S. 30, T. 15, R. 1 W. Their first appearance to the south-west of the break or gap is in the spring branch that runs down from Haygood X Roads or in the eastern part of the N. E. ¼ of S. W. ¼ of S. 30, T. 15, R. 1 W. From this point they are continuous to the south-west without a break for some 8 miles or to Tarrant's Gap in the S. E. ¼ of S. 29, T. 16, R. 2 W. They, together with some overlying strata, start up as a ridge or as a continuation of West Red Mountain, in the N. W. part of the N. E. ¼ of S. W. ¼ of S. 30, T. 15, R. 1 W., that is especially high as far to the south-west as the gap of Cunningham Creek in the N. E. ¼ of S. W. ¼ of S. 10, T. 16, R. 2 W. At the north-east end of this ridge or of this portion of West Red Mountain, along the Jasper road in the center of the W. ½ of S. W. ¼ of S. 30, T. 15, R. 1 W., there are the outcrops of seemingly three different seams of ore. At this north-east end of West Red Mountain, low down on it or near its south-east foot, there is in the N. W. corner of the S. W. ¼ of S. W. ¼ of S. 30, T. 15,

R. 1 W., an outcrop that shows the upper 8 ft. 6 in. of a seam of ore. This outcrop is bent over to the north-west until it has a dip of about 50 deg. to the south-east. Some 75 yards to the south-west of it, there is an other outcrop, and a test pit in which there is the following section :

Section of Test Pit in the S. W. ¼ of S. W. ¼ of S. 30,
T. 15, R. 1 W.

(4) Shales, Sandstones; sandstones are in flaggy pieces in the shale.
(3) *Ore* .... 8 in.
(2) *Ore*, Shale................ .... 2 ft. 6 in.
(1) *Ore*; soft near its top, from...10 ft. 5 in. to 11 ft .8 in.

This outcrop is bent over to the north-west until its bottom is on top or its dip is about 60 deg. to the south-east. The ore of these two outcrops is a well leached homogeneous ore with rounded siliceous grains. Average samples of it dried at 100 deg. C., gave the following analyses :

	(1)	(2)
Ferric Oxide..............	46.028	48.463
Silica......................	49.673	47:962
Phosphoric Acid...........	0.710	0.372

(1) From the north-east outcropping.
(2) From the south-west outcropping,

To the south-west nearly 3 miles, on the steep south-east side of West Red Mountain, there is the following outcropping :

Outcrop in the N. E. ¼ of S. 3. T. 16, R. 2 W.

(7) Sandstone; massive, forming a rocky row along the south-east crest of the mountain, from..........................35 to 40 ft. 0 in.
(6) Debris; from.........................50 to 60 ft. 0 in.

(5)	Shale; visible	6 to 8 ft. 0 in
(4)	*Ore*; hard	5 ft. 1 in.
(3)	Shale, *Ore*; the shale is yellowish and has near its center the ore in thin seams	1 ft. 1 in.
(2)	*Ore*	10 in.
(1)	Shale.	

In this outcrop, the upper ore is soft and friable, and the lower ore is hard. The dip of (7) is about 60 deg. and that of (1) is about 45 deg. to the west. This dip to the west is the resultant of the true north-west dip and of a dip to the south-west from a wave in the strata with a north-west and south-east trend. Still farther to the south-west, about 1 mile, or in the N. W. ¼ of N. E. ¼ of S. 10, T. 16, R. 2 W., there is about the following outcrop:

Outcrop in the N. W. ¼ of N. E. ¼ of S. 10, T. 16, R. 2 W.

(5)	Loam.	
(4)	*Ore*, Loam; principally ore	1 ft. 6 in. to 2 ft. 0 in.
(3)	Loam, *Ore*; principally loam, the ore in the lower part, about	2 ft. 6 in.
(2)	*Ore*; a hard ledge, from	6 to 8 in.
(1)	Loam.	

The ore of this outcrop is of very good quality. Its dip is about 60 deg. to the north-west.

An average sample of a well leached sandy ore, full of small rounded siliceous grains, exposed in a test pit about one mile north-east of Cunningham Creek Gap, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	42.297
Silica	52.954
Phosophric Acid	0.332

In the Cunningham Creek Gap, in the southern part of the S. E. ¼ of N. W. ¼ of S. 10, T. 16, R. 2 W., there is the following outcropping:

Outcrop in the Cunningham Creek Gap in the S. E. ¼ of N. W. ¼ of S. 10, T. 16 R. 2 W.

(5) Sandstones, Shales.
(4) *Ore*; not good, sandy, seemingly from......6 to 7 ft.
(3) Sandstones, shales; along the gap for about 60 yards.
(2) *Ore*; a homogeneous ledge, sandy, though much better than (4)....... ....1 ft. 2 in.
(1) Sandstones, Shales.

The dip of this outcrop is about 75 deg. to the north-west. An average sample of the ledge (2) containing some small rounded silicous grains, dried at 100 C., gave the following analysis:

Ferric Oxide	42.796
Silica	54.820
Phosphoric Acid	0.619

There are some ore outcrops opposite the Walton Gap or in the N. E. ¼ of S. E. ¼ of S. 16, T. 16, R. 2 W., but they are of unknown thickness.

The rocks of this formation are engulfed in a fault at Tarrant's Gap, and to the south-west of this gap for nearly 25 miles, as has been stated, they are for the most part engulfed in faults and when not engulfed in faults they are badly crushed and broken up. They are engulfed in a fault at Boyle's Gap in the N. W. ¼ of S. 6, T. 17, R. 2 W. Between this gap and the gap of the Georgia Pacific Railroad in the N. E. ¼ of S. 15, T. 17, R. 3 W., they show only in a few places, as small loose rocks. They are engulfed in a fault also at this last named gap, though they set in again just to the south-west of it and are then believed to be continuous, though badly squeezed and broken up, to the south-west to the Pratt Mines Railroad in the N. E. ¼ of N. W. ¼ of S. 29, T. 17, R. 3 W. Between these two railroads, y at some points make a considerable ridge and at er places seem to be almost, if not wholly, enlfed in faults. Just to the north-east of the Pratt nes Railroad, they appear to be squeezed up between o faults, bringing them in contact with Coal Meases on the north-west and Cambrian strata on the southst.

The following is given by Dr. W. B. Phillips as an anysis of a fine grain soft red ore 4 feet 6 inches thick opping out in the county road just to the north-east of e Pratt Mine Railroad near Thomas:

Silica	35.20%
Metallic Iron	40.22%
Phosphorus	Trace

To the south-west for nearly a mile, the strata of this ormation appear to be completely engulfed in a fault. They make their next appearance in a little cut on the Kansas City, Memphis, and Birmingham Railroad at the rossing of the Ensley Dummy Line in the N. E. ¼ of S.E. ¼ of S. 30, T. 17, R. 3 E. The following is given by Dr. W. B. Phillips as an analysis of a dried sample of a seam of fine gain *soft ore* 15 feet thick that crops out here.

Silica	55.60%
Metallic Iron	24.61%
Phosphorus	Trace

At this outcrop the strata have a dip to the south-east, though they are badly broken up. They form a knoll ust to the south-west and again make their appearance n the Ensley Dummy Line, on the west bank of Vilage Creek, in the S. W. ¼ of S. E. ¼ of S. 30, T. 17, . 3 W. This outcrop is at the south-east foot of a low dge that is capped with Coal Measures. Its strata are badly squeezed and broken up and have been p over towards the north-west until they have a about 60 deg. to the south-east. They also show that they are in waves and wrinkles with a nortl and south-east trend. This low ridge does not e over 300 yards to the south-west before it graduall out and a low flat country sets in, along which the of this formation are engulfed in a fault.

These rocks next show themselves to the south-w the N. W. ¼ of S. 11, T. 18, R. 4 W. on the sout side of another ridge that is capped with Coal Mea This ridge is higher than the last one and is s mile long. To the south-west of this ridge, the of this formation are completely engulfed in a fau about 4 miles, to where they bend towards the and the big fault leaves the edge of the valley an ters the Coal Measures opposite or north-west of I mer. Here, at the northern end of the outcro rocks of this formation are in contact with those o Coal Measures, and, to the SSW. for about 3 miles help to form a very broken, faulted and irregular b country. They, in this broken belt of country, in ing the change in their strike, are broken up into a or number of short projecting and overlapping r that are separated from each other by fault in places partly by other strata. The projecting of these short ridges look like spurs ex ing out from a broad broken ridge. the SSW. end of this broken ir lar belt of country, the rocks of this formation are pletely engulfed in a fault for nearly a mile to the s west, to were they set in again as a narrow ridg broken country of Sub-carboniferous strata. This row ridge is about 1 mile long, extending to south to just across Valley Creek. It has a fault along its south-east foot and a showing of ore near its south-west end.

Along Valley Creek, the strata are all broken up and thrown out of line, the next rocks of this formation appearing in a ridge on the south side of the creek several hundred yards to the east of the end of the last mentioned short ridge on the north side of the creek. They are here, to the south of Valley Creek, all broken up for nearly a mile to the south-west or to the crossing of Five Mile Creek, consisting of a couple of high short ridges in Sub-carboniferous strata. These two short ridges have of course a fault along their south-east foot. On top of the north end of the more northern one, there is an old test pit with the following section:

Sections of Test Pit near the Center of the S. W. ¼ of S. 12, T. 19, R. 4 W.

(3) Debris.
(2) *Ore*; very good........................... 1 ft. 2 in.
(1) Sandstone.

The strata here are bent over to the north-west until they have a south-east dip. The ore of this pit in an outcrop with flatened rounded grains and a shaly appearance about ¼ mile to the south is some 2 feet thick. It here has the following composition, as shown by an analysis of an average sample, dried at 100 deg. C.:

Ferric Oxide	86.739
Silica	9.609
Phosphoric Acid	0.362

From this Five Mile Creek, West Red Mountain is continuous to the south-west to the county line. On the top of this mountain in the S. E. ¼ of N. E. ¼ of S. 23, T. 19, R. 4 W., there is the following outcroping:

Outcrop in the S. E. ¼ of N. E. ¼ of S. 23, T. 19, R. 4 W.

[5]	Debris; may cover some ore.	
[4]	*Ore;* a solid ledge	1 ft. 7 in.
[3]	Loam	1 to 2 in.
[2]	*Ore;* shaly	4 to 6 in.
[1]	Loam.	

The dip of this outcrop is about 85 deg. to the north-west. An average sample of its ore, well leached, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	51.987
Silica	43.789
Phosphoric Acid	0.156

On the north-west side of the mountain and so seemingly of a seam higher up in the formation than this one, there is, in an old test pit about ¼ mile to the south-west, an outcrop of ore from 6 to 7 feet thick. This ore is well leached, though it still shows some evidence of fossils. It is sandy, though some portions of it are better than others. It has the rounded flattened grains. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	54.029
Silica	43.206
Phosphoric Acid	0.188

Its dip is about 60 deg. to the north-west.

In a test trench over the top of the mountain in the S. W. ¼ of S. 26, T. 19, R. 5 W., there is exposed 4 seams of ore. The top seam is a thick seam but it is too sandy to be of any value; the next to the top seam is of very fine ore but it is thin; the next seam, the one next to the bottom, is also too sandy to be of any value, while the bottom seam is of very good ore. These lowest two seams, as it is believed, show up in a trench on the south-east side of the mountain in the S. E. corner of N. E. ¼ of S. 34, T. 19, R. 5 W. In this trench, the upper seam is from 8 to 10 feet thick but it is too sandy to be of any value, and the lower seam is of tolerably good ore but it is thin. The dip here is about 75 deg. to the north-west. The ore seam next above the upper of these two seams, the next to the top seam in the previous trench, makes, as it is believed, the outcrops of a seam from 20 inches to 2 feet thick, of very good *soft ore*, that occur a short distance to the south-west. These outcrops form a ledge along the top of the mountain with a dip of about 75 deg. to the north-west. There is a great deal of loose ore, some of it in large pieces, scattered over the surface, broken off from the ledge. This ore is believed to be of the same seam as the ore in the old test pit on the north end of the ridge just south of Valley Creek. This same seam, as it is believed, and another one under it, form the ore outcrops in the S. E. ¼ of S. E. ¼ of S. 34, T. 19, R. 5 W. In these outcrops, it has the following section:

Outcropping in the S. E. ¼ of S. E. ¼ of S. 34, T. 19, R. 5 W.

(4)	Shale; yellow.	
(3)	*Ore;* soft and dirty	4 ft. 4 in.
(2)	*Ore*; hard, solid, good	1 ft. 6 in.
(1)	Loam.	

The lower 2 feet of (3) of this outcropping is very soft and dirty; it is believed to be all ore, though the dirt in it may hide some shale partings. The dip is about 40 deg. to the north-west. Its ore is well leached and has in it the rounded flattened grains, though it has a scaly appearance. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	78.637
Silica	14.859
Phosphoric Acid	0.108

The ore seam under this one or the lower ore seam here shows as a hard ledge about 12 inches thick. To the south-west of these outcrops, there is loose ore scattered over the top of the mountain until the next bedded outcrops are seen in the N. E. ¼ of N. E. ¼ of S. 9, T. 20, R. 5 W. These bedded outcrops are of a ledge of good ore about 15 inches thick. This ledge is bent over towards the north-west until its dip is about 80 deg. to the south-east. A few steps farther to the south-west, there is the following outcropping:

Outcropping in the N. E. ¼ of N. E. ¼ of S. 9, T. 20, R. 5 W.

(4)	*Ore;* ledge	1 ft. 3 in.
(3)	Loam; red, may cover soft *ore*	1 ft. 2 in.
(2)	*Ore;* ledge	2 ft. 0 in.
(1)	Debris.	

This outcropping is doubtless of the upper of the two seams mentioned above. A few steps still farther to the south-west, it shows up better, thus.

Outcropping in the N. E. ¼ of N. E. ¼ of S. 9, T. 20, R. 5 W.

(5)	Sandstones; flags, visible about	6 ft. 0 in.
(4)	*Ore:* very good, hard	1 ft. 8 in.
(3)	*Ore:* very soft, with thin streaks of shale in places	2 ft. 4 in.
(2)	*Ore;* about	1 ft. 9 in.
(1)	Debris.	

The ore of this outcrop is lenticular or is of little rounded flattened grains. It is also micaceous and shaly. It is well leached, though it shows some fossil impressions. It is bent over towards the north-west until its dip is about 75 deg. to the south-east. An average sample, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	80.513
Silica	13.854
Phosphoric Acid	0.224

Loose ore is scattered over the top of the mountain for about 1 and ½ miles to the south-west. Near the county line or in the N. W. ¼ of N. E. ¼ of S. 19, T. 20, R. 5 W., there is the following outcropping:

Outcropping in the N. E. ¼ of N. E. ¼ of S. 19, T. 20, R. 5 W.

(13)	Shale; yellow.	
(12)	*Ore;* soft and good, about	3 ft 1 in.
(11)	Loam; clayey	8 to 10 in.
(10)	*Ore;* good	1 ft. 6 in.
(9)	Debris; about	30 ft. 0 in.
(8)	*Ore;* good, seemingly from	8 to 10 in.
(7)	Debris, Sandstone; about	30 ft. 0 in.
(6)	Loam; red, clayey, from	5 to 6 in.
(5)	*Ore*; ledge	1 ft. 4 in
(4)	*Ore*, Shale; the ore is shaly	8 in.
(3)	Shale, Loam; the shale is yellowish and the loam is red	1 ft. 0 in.
(2)	*Ore*; ledge	1 ft. 7 in
(1)	Loam.	

This outcropping, as can be seen, shows 3 different seams of ore. Its dip is about 75 deg. to the south-east.

The south-east belt or "East Red Mountain" has continuous strata, without a break, clear through the county from north-east to south-west. Near the county line on the north-east or in the S. W. ¼ of N. E. ¼ of S. 9, T. 15, R. 1 E., there is an outcropping of a sandy ore seam that shows to a thickness of from 5 to 7 feet. Its dip here is from 40 deg. to 50 deg. to the south-east. To the south-west, on the side of the mountain, near the top, in the N. W. ¼ of N. W. ¼ of S. 16, T. 15, R. 1 E., there are several old test pits into the outcroppings of a seam of poor ore. In one of these old pits, there is exposed about the following section :

Section of Test Pit in the N. W. ¼ of N. W. ¼ of S. 16, T. 15, R. 1 E.

(8)	Shale ; yellowish, visible about	3 ft. 0 in.
(7)	*Ore*, Shale; mixed	7 in.
(6)	Shale ; yellowish, with perhaps some thin streaks of *Ore* in places	1 ft. 3 in.
(5)	*Ore;* hard and sandy	2 in.
(4)	*Ore*, Shale ; in alternate streaks, the ore is sandy	1 ft. 5 in.
(3)	Shale ; yellowish	2 in.
(2)	*Ore;* about	1 ft. 0 in.
(1)	Shale ; yellowish, visible about	5 in.

In an other of these old pits, about 75 yards to the north-west, the outcropping is about the same as the above. The dip here appears to be from 8 deg. to 10 deg. to the south-east. Just to the south-west of these outcrops, along the Springville road, the rocks of this formation are the surface strata clear across the here narrow, only about ½ mile wide, synclinal mountain between the Clayton Cove, the south-east prong of the head of the Birmingham Valley, and the Massey Cove. To the north-east of here, however, the rocks of this formation on the top of the synclinal mountain are covered in spots by (g) Fort Payne Chert, and to the south-west of here, on the Big Cahaba Creek, along the lowest and central part of the synclinal mountain, there are patches of the bedded strata of this formation exposed by the removal by denudation of the overlying (g) Fort Payne Chert. Some loose pieces of ore occur along the Springville road in the N. W. ¼ of S. E. ¼ of S. 17, T. 15, R. 1 E. They have doubtless worked their way down the side of the mountain just to the south-east. Some massive sandstones of the upper strata of this formation in outcrops along the Big Cahaba Creek in the S. E. ¼ of S. 30 T. 15, R. 1 E., are in waves with a north-east and south-west trend, though they have a slight general dip to the south east. These upper strata near the north-west edge of the synclinal mountain in the N. E. ¼ of S. E. ¼ of S. 25, T. 15, R. 1 E., have a dip of from 70 deg. to 75 deg. to the south-east. There crops out here a seam of hard compact ore about 6 inches thick. It is lenticular or has in it rounded flattened grains. It is also fossiliferous. To the south-west of here for some ½ mile, a low flat country takes the place of East Red Mountain. In it, more than probable some of the strata of this formation are engulfed in a fault; others however are continuous across it, though, in places at least, they are about vertical.

The strata of this formation along Big Cahaba Creek at Duke's old mill in the S. W. ¼ of S. W. ¼ of S. 30, T. 15, R. 1 E. have been laid bare and cut down into to a depth of about 100 feet. The dip here appears to be from 10 deg. to 15 deg. to the west. In this patch of exposed strata, there is, at Self's old mill in the N. W. corner of S. 6, T. 16, R. 1 E., the following outcropping:

Outcropping at Self's Old Mill in the N. W. Corner of S. 6, T. 16, R. 1 E.

(7)	Sandstones, Shales.	
(6)	*Ore*; very good, about	3 ft. 10 in.
(5)	Shales, Sandstones	3 in.

(4)	Sandstone; very ferruginous, of a grey color	1 ft. 0 in.
(3)	Shales; yellowish, about	1 ft. 0 in.
(2)	*Ore*; siliceous, of a greyish color	6 in.
(1)	Sandstone; yellowish, just visible.	

The dip of this outcrop is about 15 deg. to the north-west. Some 200 yards to the north-east of it, in a branch, there are several outcrops of ore that form cascades along the branch. Some 200 yards still higher up the branch to the north-east, there is an outcrop of a grey siliceous ore of a higher seam in the formation. This siliceous ore is here visible to a thickness of about 8 feet and in the loam and debris over it there is some good friable ore in loose pieces that must come from a still higher seam. The dip of this outcrop is about 10 deg. to the north-west. An other outcropping of ore is reported to be about 1 mile higher up the branch. At the south-west end of this patch of exposed strata or about ¼ mile south of Self's old mill, the bed and west bank of the creek is of a ferruginous flaggy sandstone that appears to be about level and hence it is likely at or near the bottom of the synclinal trough of the mountain.

In a ravine in the N.W. corner of S. 1, T. 16, R. 1 W., there is an outcrop of a seam of siliceous ore abouth 5 ft. 6 in. thick. Its dip is about 15 deg. to the south-eas This same seam, it is believed, makes the ore outcro on the side of a ravine in the northern part of S. 2. T. 1 R. 1 W. These outcrops form a ledge several hundr yards in length that has a dip of about 15 deg. to t south-east and is in most places about 4 ft. 4 in. thi

Its ore, a mere mass of small rounded flattened sili ous grains, is well leached. An average sample of i dried at 110 deg. C. gave the following analysis:

Ferric Oxide	31.946
Silica	63.727
Phosphoric Acid	0.824

Analsyst:—J. L. Beeson.

On the south-east slope of the mountain, in the outcrops of the upper strata of this formation along a road in the S. E. ¼ of S. 2, T. 16, R. 1 W., there is a ledge of very hard ore with large rounded flattened grains and small pebbles. This ledge is about 16 inches thick. Farther up the road some 75 yards to the north-west, with a deep red or iron stained loam between, there is an outcrop of the Big or Red Mountain Seam, the ore seam that farther to the south-west furnishes most of the red ore that is mined in the State. It is here however sandy and pebbly, though it appears to have some good ore in it. This outcrop is all of 5 feet thick. Some 200 yards to the south-west, in the road down the north-west slope of the mountain and some 10 feet lower than the crest of the gap, there is an outcrop of a seam of limy ore or ferruginous limestone that shows to a thickness of about 26 inches. Its dip is about 20 deg. to the south-east.

Along the Trussville and Haygood's X Roads as it passes over East red Mountain in the northern part of S. 22. T. 16, R. 1 W., there crops out in the upper strata of this formation a hard sandy ore ledge from 10 to 12 inches thick and, some 75 feet lower down in the strata, there is an outcrop of an other sandy ore seam, and, some 40 feet still lower down in the strata, the bed of the road is formed by an outcrop of a hard ore about 2 feet thick that is the lower bench of a seam. It is a well leached siliceous ore with yellowish splotches, the last remains of fossils. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	62.771
Silica	30.082
Phosphoric Acid	0.352

This lower bench is separated by a parting of shale from the upper bench which is of a softer ore seemingly several feet thick. The general dip here is about 20 deg. to the south-east, though the strata are in waves with a general north-east and south-west trend.

On the Trussville and Birmingham road, in a well to the south-east of the crest of the mountain or near the center of S. 21, T. 16, R. 1 W., a seam of good ore is said to have been struck. Along this road as it goes down the steep north-west side of the mountain, there crops out some 30 feet below the top of the gap a seam of ore about 15 feet thick. This is a fine grain sand ore that is entirely free of the rounded flattened grains. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	19.461
Silica	72.883
Phosphoric Acid	0.216

A pebbly or conglomerate seam of ore, higher in iron than the above very sandy seam, crops out 75 to 100 feet lower down the mountain, near the bottom of the formation. The dip here is about 30 deg. to the south-east.

To the south-west of here for some distance, a massive sandstone crops out along the top of the mountain and there is a great deal of loose ore over the south-east slope of the mountain. On the side of a high point in the S. E. ¼ of S. 21, T. 16, R. 1 W., there is the following outcropping:

Outcropping in the S. E. ¼ of S. 21, T. 16, R. 1 W.

(5)	Debris.	
(4)	*Ore*; about	1 ft. 8 in.
(3)	Loam; may cover *Ore*	4 in.
(2)	*Ore;* visible to a thickness of	2 ft. 6 in.
(1)	Debris.	

The ore of this outcrop is compact and has in it large flattened rounded grains. Average samples of it and of an ore outcrop down on the south-east side of the mountain, about 4 feet thick and believed to be of the same seam, dried 100 deg. C., gave respectively the following analyses:

	(1)	(2)
Ferric Oxide	64.322	44.781
Silica	28.371	49.899
Phosphoric Acid	0.385	0.924

At the Edwards' or Smith and Eastman Mines, in the S. W. ¼ of N. E. ¼ of S. 28, T. 16, R. 1 W., there is the following outcropping:

Outcropping at the Edwards' or Smith and Eastman Mines, in the S. W. ¼ of N. E. ¼ of S. 28, T. 16, R. 1 W.

(5)	Sandstones, Shales; may have one or more ore seams in it	
(4)	*Ore;* the seam mined, known here and to the south-west as the "*big vein*" or the "*Red Mountain Seam*," about	10 ft.
(3)	Shales, Sandstones, Debris; about	40 ft.
(2)	*Ore;* a soft or loose black ferruginous clayey sand, from	3 to 4 ft.
(1)	Debris	

The "big vein" ("Red Mountain Seam") (4) of the above section, has the following section in detail:

Section of "Big Vein" ("Red Mountain Seam") at the Edwards' or Smith and Edwards Mines in the S. W. ¼ of N. E. ¼ of S. 28, T. 16, R. 1 W.

(3) *Ore;* the best part of the seam, from . .4 to 7 ft. 0 in.
(2) Parting; usually a shale, though sometimes a hard ferruginous sandstone and sometimes a *good ore* with hard black streaks, from . 0 ft. 1 to 6 in.
(1) *Ore:* with hard flattened kidney shaped balls of calcite in the lower 18 inches, about . . . . . . .4 ft. 0 in.

The dip here is from 10 deg. to 15 deg. to the southeast. The following analyses are of average samples of the two benches of this seam on and away from the outcrop at these mines;

	(1)	(2)	(3)	(4)
Ferric Oxide. . . .	67.870	67.309	42.218	50.200
Silica. . . . · · · · . .	24.567	14.983	40.678	31.233
Phosphoric Acid	0.715	0.960	0.626	0.906
Carbonate of Lime	——	1.484	10.283	8.120

(1) Upper bench on the outcrop A compact ore with the rounded flattened pebbles.

(2) Upper bench away from the outcrop or within the mines. A hard compact ore with a few of the large rounded flattened grains.

(3) Lower bench on the outcrop. A well leached ore that in places is a conglomerate of the rounded flattened grains and in other places a compact ore without any of the rounded flattened grains.

(4) Lower bench away from the outcrop or within the mines. A compact ore with a few of the large flattened grains or small pebbles that are as large as peas.

Some 40 feet under this "big vein" here at the mines, there is an other ore seam that in the well leached outcrop is a very black loose sandy loamy looking ore with small yellowish brown looking specks. It is from 3 to 4 feet thick. An average sample of it, dried at 100 deg. C., gave the following analysis :

Ferric Oxide	47.130
Silica	39.105
Phosphoric Acid	0.781

In an old test pit, partly filled up when seen, near the foot of the south-east side of the mountain in the N. E. ¼ of N. E. ¼ of S. 29, T. 16, R. 1 W., there is a seam of ore that was visible to a thickness of about 3 feet and that is said to be 6 feet thick. It is a well leached homogeneous ore, with the round flattened grains. It is most probably the "big vein." An average sample of its exposed upper 3 feet, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	78.236
Silica	14.103
Phosphoric Acid	0.534

Just to the northwest of the Edward's Gap, in the S. E. ¼ of S. E. ¼ of S. 19, T. 16, R. 1 W., in the edge of the broken country of (c) Siliceous (Knox) Dolomite and Chert, with a narrow valley between them and Red Mountain, there is a patch of badly broken up strata with some red ore that is believed to be of this formation, though it may belong at the top of the (c) Siliceous (Knox) Dolomite and Chert or bottom of the (d) Pelham (Trenton) Limestones. It is believed to have been pushed over from Red Mountain on top of the cherty ridges of the (c) Siliceous (Knox) Dolomite and Chert Formation and it may possibly be that its strata are now connected across the narrow valley with those of Red Mountain. Its farthest end is about ¼ mile from the foot of Red Mountain. Its strata have almost an east and west strike, a little north of east, and a dip in places of from 20 deg. to 30 deg. towards the north. They are in contact on the north and west with (c) Siliceous (Knox) Dolomite and Chert strata or they appear to be right on the top of these cherty strata. A well in their southern edge is said to have struck a seam of ore about 4 feet below the surface and to have continued in it for 22 feet or to the bottom of the well. To the west of this well some 200 yards, there is an old test pit in an outcrop of well leached red ore with the rounded flattened grains. It shows about 3 feet of the ore which is not believed to be much thicker. An average sample of this exposed ore, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	73.845
Silica	13.247
Phosphoric Acid	0.452

It may be that the above patch of broken up strata with red ore is of the steep north-west side of a broken or faulted unsymmetrical synclinal and just south of an east and west fault that runs through the Edward's Gap.

The outcrops of the rocks of this formation to the south-west for some distance are almost entirely on the south-east side of the crest of the mountain. Over the tops of some high points of the mountain just to the north-east of the Koepler Gap in the N. W. ¼ of S. 31, T. 16, R. 1 W., there are some outcrops of ore as massive boulders. The seam of these ore outcrops show to a thickness of 30 inches, though it is believed to be much thicker or to be 4 or 5 feet thick and to be in two benches with a parting of shale, a few inches thick, between them. It is a well leached homogeneous ore with the rounded flattened siliceous grains of about the size of flax seed. It is also a little scaly with the appearance of having been subjected to great pressure. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	75.693
Silica	17.179
Phosphoric Acid	0.421

There is a great deal of loose ore over the high point just to the north-east of the Sadler Gap in the N.W. ¼ of S. W. ¼ of S. 6, T. 17, R. 1 W. Its seam must be of considerable thickness. In the Burgess Gap, a high gap in the N. E. ¼ of N. E. ¼ of S. 12, T. 17, R. 2 W., the rocks of this formation are covered by loose fossiliferous chert, which has doubtless rolled down from the high points to the north-east and south-west of the gap. On the north-west side of the high point just to the southwest of this gap, there is an outcrop of ore in large boulders. These large boulders must come from a thick seam. There may be several different seams of ore here. To the south-west, in the S. E. ¼ of S. 12, T. 17, R. 2 W., there is along near the top of the mountain, on the north-west side, a bluff some 50 feet high of a massive sandstone. This rock is in great waves with a north-west and south-east trend. The billows of these waves correspond to the high points of the mountain and their troughs to the gaps and low places in the mountain. These massive sandstones below the surface are doubtless calcareous. The outcrops of the strata just over these sandstones have over them a great deal of loose ore. This loose ore as a general thing occurs on the south-east sides of the high points of the mountain and along the top of the mountain in the lower places. The soil derived from the strata over the above massive sandstones is very red and very productive. In these strata or in the upper part of the formation, there are here three different seams of ore, as can be seen in the outcrops down on the south-east side of the mountain. The lowest of the ore seams is not over 20 feet from the massive sandstone. These three seams are known, commencing at the top, as the "Ida Seam," "Big or Red Mountain Seam," and "Irondale Seam." The Irondale Seam is not over 20 feet above the massive sandstone. These ore seams here, and for some 2 miles at least to the south-west, occur about as in the following section:

Section for some 2 Miles Opposite Irondale.

(6)	Shales, Sandstones; good cover.	
(5)	*Ore*; compact, "*Ida Seam*"	5 to 6 ft.
(4)	Shales, Sandstones, *Ore*; the ore in thin streaks	5 to 6 ft.
(3)	*Ore*; "*Red Mountain or Big Seam*," about	22 ft.
(2)	Sandstones, Shales; yellowish	2 to 36 ft.
(1)	*Ore*; "*Irondale Seam*"	3 ft. to 5 ft. 6 in.

The ore seams are closest together on the outcrops. On the high points of the mountain, the Irondale Seam usually crops out along the top of the mountain and the other two down on the south-east side of the mountain; in the low places, they all crop out down on the south-east side of the mountain.

The *Irondale or Sloss Upper Mines* are mainly on the outcrops of the bottom or Irondale Seam in the ravines down on the south-east side of the mountain. These mines in 1894 had an output of 94,771 long tons of iron ore. They now consist of entries on both sides of five ravines that are from ¼ to ½ mile apart. The most north-east one is about in the N. W. ¼ of S. E. ¼ of S. 12, T. 7, R. 2 W., and the most south-west one is about in the N. E. ¼ of S. W. ¼ of S. 13, T. 7, R. 2 W. Commencing with the most north-east of these mines, they are known as No. 2, No. 4, No. 1, No. 3, and No. 5

3½. No. 1 however, is worked out of *soft* or leached ore. The bottom or Irondale Seam may be said to be the only seam worked, as the other two have been worked only to a very limited extent. The lower 4 feet of the Irondale Seam hold its best ore. It has just over it on the outcrop a soft sandy ore, called *gouge*, that makes a poor roof. This gouge becomes under a good cover a hard ferruginous sandstone with no seam of stratification between it and the ore into which it gradually passes.

These mines consist of planes running up each side of the ravines at an angle that corresponds to the dip of the ore, and of entries at intervals of from 50 to 60 feet along the planes. The entries run almost on water level, rising with a slight grade. Along the entries at intervals of from 20 to 25 feet are the headings.

Only *soft* or leached ore is mined at these mines, and hence the entries are stopped as soon as *hard* or limy ore is struck. The *soft* or well leached ore of the Irondale Seam suddenly turns to a very *hard* or limy ore at a distance from the outcrop that seems to be entirely dependent on the cover. These distances therefore get greater and greater as the entries are numbered going up the ravines, the upper entries never striking *hard* or limy ore. The following extracts are from a description of No. 1 in the "The Engineering and Mining Journal," Oct. 1, 1892.

"At intervals of from ½ to ¾ of a mile the southern face of the hill is cut by narrow ravines, the effects of erosion. These ravines expose the edge of the ore seams along each flank, and they have generally been taken advantage of as being cheap and convenient locations for reaching the ore. The general plan is to run a spur track from the main road around into the ravine as far as the grade will allow, and to erect tipples on a bridge over the tracks, from which the mine cars are emptied into the railroad cars. At these mines all the mining so far is above the level of the railroad, and years will elapse before it becomes necessary to follow the ore by sinking slopes below water level; therefore, the loaded cars have to be lowered to the tipples by self-acting planes. Ventilation is effected by the "upsets," being driven from the upper entry up and out to the surface at the outcrop. *No 2 Mine* of the *Sloss Iron and Steel Co.* may be taken as one of the best examples of the class, and great credit is due to Thomas C. Culverhouse, the superintendent, and N. S. Harris, the mine foreman, for the splendid arrangement of the plant, and the practical and economical method adopted in mining and handling the ore......The railroad under the tipple is double-track, so that two railroad cars can be loaded at once......From the end of the bridge which carries the tipples and tracks commence the planes, which run up each flank of the ravine at distances of about 50 feet apart; the mines or entries are driven into the ore bed along these planes. The carriage that carries the mine car is built so that its deck or platform is level, while runing on the plane at an angle of 18 deg. It carries two mine cars, standing side by side, across its deck. The balance car is strongly framed and fitted with a sheave lying at the same angle, and in the same plane, with the strain on the rope. The car is loaded with ore until it has sufficient weight to start and hoist the carriage with two empty cars on it when the breaks are slacked off. When the empty cars are replaced at a landing by two loaded ones it adds over two tons to its weight and changes the balance in favor of the load, so that the loaded cars hoist the balance car.

The "cable" is a one-inch diameter steel hoisting rope, and by keeping the rollers on the plane in good repair and the rope well lubricated with tar one rope will generally work out the mine to a distance of 1000 feet. As before stated, the ore at this mine is about 3 and ½ feet thick, dipping south 18 deg. It is claimed to contain 55% of iron, therefore the bed is equivalent to a bed of solid pig iron 21 inches thick. Assuming the weight of cast iron at 450 lbs. per cubic foot there would be 4 tons per square yard of the seam or about 19,360 tons per acre as measured on the dip. The management claim that nearly all of the ore is extracted in the final mining of the pillars, but allowing 90% as the total result which would be much the above the average result in Alabama, the yeild of iron per acre would be about 12,424 tons. The bedding planes run nearly parallel with the dip, from 3 to 4 feet apart, with clearages which cut the seam into blocks that are of great advantage in mining. Between the ore and the roof of mine occurs a few inches of a comparatively soft and friable slaty gouge; the minor works this out with the pick until clearage is reached, and then breaks out the ore with wedges, or by blasting. The entries are 50 feet apart, driven 16 feet wide, on a grade of 6 inches in 100 feet. Three rows of props are stood on the lower side, leaving 7 feet along the upper side clear for the tracks. The road bed is leveled by cutting up the bottom on the upper side, the rubbish from this cutting and from the gouge being used as filling. The upsets, 24 yards apart, are 6 feet wide where they leave the entry. At 2 yards up they are widened to 10 feet, and driven up through the next entry with a narrow opening at the top. The upsets are driven so that the upsets of one entry are opposite the pillars of the next. The work inside the mine is by contract, and paid by the carload. The box of the mine car is 6 x 3 x 1½ feet, and holds 27 cubic feet or 1 cubic yard of broken ore, which when loaded is called a ton, although it probably weighs more than a ton. The price paid in the entry is 60 cts. per car for the first 400 feet from the plane and 2½ cts. per car extra for every additional 400 feet up to 1000 feet. The price in the upsets and pillars is the same. This includes mining, loading tramming, propping and putting down the track, but does not include keeping the track in repair. In mining backward, the pillars are worked like *long wall*, and the top allowed to close behind the mines, keeping the face open by the use of props. When the strata over the seam become too thin or too near the outcrop for underground mining, the cover is removed by stripping, which costs about 14 cts. per cubic yard. This stripping allows the ore to be quarried. The mine has now 25 entries on the west and 18 on the east plane, and when working to its full capacity produces about 500 tons per day. Eight men are necessary to operate the plant, exclusive of contractors, including a ticket clerk, switchman, brakeman, plane-runner, and tippleman for each plane. In addition, there is a mine boss, a blacksmith, and a carpenter. The total cost of the labor may be approximated at:—mining, tramming, etc. per ton, 50 cts.; handling outside, 3 cts.; repairs of cars and track, 1 ct.; timber for props 5 cts.; boss, salary, 1 ct.; making a total of 60 cts. per ton. The mine is within the 25 cts. limit of Birmimgham, and the general price expected, as the royalty is 25 cts. Therefore the cost at the furnace may be set down as 60 cts. plus, 25 cts. plus, 25 cts. = $1.10 per ton. The loss from wear, interest, and the depreciation of the investment is expected to be covered by the profits from the sale of supplies at the mines and at the store; the exact figures of these sources of profit and loss are not easily obtained."

At No. 1, the Ida Seam and about 9 feet of the Big Seam were worked. In the Big Seam, there are irregular pockets of a sandy loam.

Average samples of the ore of the three seams at the above mines, dried at 100 deg. C., gave the following analyses:

	(1)	(2)	(3)	(4)	(5)	(6)
Ferric Oxide........	74.590	58.485	34.96	59.54	48.054	44.940
Silica...............	19.190	23.139	41.52	34.11	48.192	39.280
Phosphoric Acid.....	0.516	1.446	0.33	0.36	0.466	0.186
Lime Carbonite......	......	8.850	19.54	.....	......	10.320

(1) Lower 4 feet or the better part of the Irondale Seam from within 8 feet of the mouth of the entry and about 180 feet on the dip from the outcrop. A weathered ore of comparatively small rounded grains with a few yellowish brown spots of almost obliterated fossils.

(2) Lower 4 feet or the better part of the Irondale Seam some 350 yards from outcrop and under some 150 feet of cover. A hard compact ore.

(3) Lower 18 inches or the inferior part of the Irondale Seam from just over sample of analysis (2). A hard looking ore with rounded grains and a few thin streaks of calcite.

(4) Big Vein or Red Mountain Seam on the outcrop. A well leached ore. Some of it full of the rounded flattened grains while some of it has but few if any of these grains.

(5) Ida Seam on the outcrop under 6 to 8 feet of cover. A homogeneous ore with the small rounded flattened grains and with yellowish brown specks of fossil impressions.

(6) Ida Seam about 300 feet on dip from outcrop and under about 125 feet of cover. A homogeneous ore full of the small rounded flattened grains.

There is another mine about ½ mile to south-west of No. 3½.

The rocks of this formation in the Red Gap, Plate X, in the N. W. ¼ of S. E. ¼ of S. 23, T. 12, R. 2 W., are badly broken up and are farther to the north-west than they ought to be. Plate X, shows only a few of them only the loose boulders on the side of the ridge near the B. M. & M. R. R. trestle. These strata show at least one seam of ore, a thick sandy seam with a big red outcrop, hence the name, "Red Gap." It is a well leached homogeneous ore that is full of the rounded flattened siliceous grains. An average sample of it, from the badly wearthered dirty outcrop in the G. P. R. R. cut at Gate City, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	31.889
Silica	63.875
Phosphoric Acid	0.292

Some ¾ mile to the south-west of this gap or about in the S. E. ¼ of N. W. ¼ of S. 27, T. 17, R. 2 W., the "Red Mountain Seam" or the "Big Vein" forms a bluff some 14 feet high along the north-west side of the mountain. Over this bluff, on the sloping north-west side of the mountain, near its top, there crops out a seam of very sandy ore or ferruginous sandstone from 12 to 14 feet thick. This very sandy ore corresponds to the "*Ida Seam.*" The "*Irondale Seam,*" just under the "*Big Vein,*" is here too the best ore. It had only been drifted into when last visited in 1887, and has the following sections:

Sections of the "Irondale Seam" in the S. E. ¼ of N. W. ¼ of S. 27, T. 17, R. 2 W.

(a) Section in Drift within 6 to 8 Feet of Outcrop.

[6]	"*Big Vein*"; *bluff.*	
[5]	Shale; of a light bluish color	23 in.
[4]	*Ore*; sandy, from	4 to 5 in.
[3]	Shale; yellowish, from	4 to 6 in.
[2]	*Ore*: with a clay streak 12 in. from top	48 in.
[1]	Shale; yellow.	

(b) *Section some 40 Feet within Drift on Water-level.*

(4) *Ore;* roof probably (4) of Section 1.
(3) Shale, Sandstone.......... .... 30 in.
(2) *Ore*, with a clay streak about 12 in. from top.......... 49 in
(1) Shale.

A mixture of average samples of (2) of the above two sections, a well leached homogeneous ore with the small rounded flattened siliceous grains, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	60.489
Silica	29.814
Phosphoric Acid	0.247

The ore here or near here is now being mined, so reported.

At the mines of the old Irondale or McIlwain Furnace, on the south-east side of the crest of the mountain to the south-east of Woodlawn or about in the S. E. corner of S. 28, T. 17, R. 2 W., there is something like the following outcropping:

Outcropping at the Mines of the Old Irondale or McIlwain Furnace in the S. E. Corner of S. 28, T. 17, R. 2 W.

(13) Fossilferous Chert, covering the south-east slope of mountain.
(12) Shale; Clinton, seemingly about......250 ft. 0 in.
(11) Sandstones, yellowish, from........40 to 50 ft. 0 in.
(10) *Ore*; the "Ida Seam," very furruginous fine grain sandstone of a grey color. 18 to 20 ft. 0 in.
(9) Debris; a few feet.
(8) *Ore*; the "big vein," very massive and full of coarse rounded grains or small pebbles of flint, from..... ....14 to 15 ft. 0 in.
(7) Shales, Sandstones; yellowish............3 ft. 2 in
(6) *Ore*; "Irondale Seam," good, the ore mined by drifts........................ ..2 ft. 6 in

(5) Sandstone; yellowish, merely visible.
(4) Debris; very red loam, may cover some ore, from........................40 to 50 ft. 0 in.
(3) Debris, Sandstones, Shales; about.......80 ft. 0 in.
(2) Sandstone; ferruginous, from......60 to 80 ft. 0 in.
(1) *Pelham (Trenton) Limestones.*

Average samples of the three seams, (10,) (8,) and (6) of the above section, dried at 100 deg. C., gave the following analyses:

	(1)	(2)	(3)
Ferric Oxide........	52.184	20.332	72.090
Silica	42.929	78.302	21.497
Phosphoric Acid.....	0.380	0.524	0.049

(1) Of (10) of the above section, the "Ida Seam," sometimes called the "gray seam." A homogeneous sandy granular ore with small rounded grains and a few yellowish brown specks, the last remains of fossils.

(2) Of (8) of the above section, the "Big vein" or "Red Mountain seam." A homogeneous ore with the rounded flattened siliceous grains,

(3) Of (6) of the above section, the "Irondale Seam." A homogeneous hard compact ore with a few small rounded flattened grains.

These mines are now being worked, so reported.

To the south-west or about in the N. E. ¼ of N. E. ¼ of S. 33, T. 17, R. 2 W., at some old surface diggings on the south-east side of the crest of the mountain, there is about the following outcropping:

Outcropping in the N. E. ¼ of N. E. ¼ of S. 33, T. 17, R. 2 W.

(4) *Ore*; the "Ida Seam," very sandy, of no value' from ....18 to 20 ft.
(2) Debris, *Ore*; the ore is soft and seemingly sandy, from........................1 ft. 6 in. to 3 ft.
(2) *Ore*; the "big vein," a solid block with a streak of yellow shale, believed to be only in places, about 7 feet from bottom, visibie to a depth of about.....................16 ft.
(1) Debris; believed to cover the "Irondale seam."

Average samples of (4) and (2) of the above section, dried at 110 deg. C , gave the following analyses :

	(1)	(2)
Ferric Oxide	23.242	47.988
Silica	75.166	47.672
Phosphoric Acid	0.542	1.090

(1) Of (4) of the last section, the "Ida Seam " A well leached homogeneons sandy ore with a few of the rounded flattened grains.

(2) Of (2) of the last section, the "Big Vein" or "Red Mountain Seam." A well leached homogeneous ore that is full of small rounded flattened grains

To the south-west of these old surface diggings for some distance, there appears to be a seam of ore about 40 feet under the "big vein." just over a ledge of thick furruginous flagstones of dull dark grey color that crops out along the top of the mountain. This ledge of flagstones is from 30 to 40 feet thick. To the south-west of here its flagstones have been quarried to a considerable extent and used for building and paving purposes in Birmingham. They are from a few inches to over 18 inches thick and are of very uniform thickness with either smooth or beautifully ripple-marked sides. Their dip is from 25 deg. to 30 deg. to the south-east. The "big vein" in its outcops along here, on the south-east slope of the mountain, can be worked very extensively by surface diggings that will require little or no stripping. One of these outcrops, showing about 13 feet in thickness of a well leached homogeneous ore, full of the small rounded flattened siliceous grains, gave an average sample with after, being dried at 100 deg. C., the following analysis :

Ferric Oxide	49.280
Silica	46.903
Phosphoric Acid	0.669

The seam just under it the Irondale Seam,'' which is in places in contact with the "big vein," is of much better ore and from its softer or more destructible nature seldom shows on the outcrop. The "big vein" where it has been blasted into on its outcrop on the south-east slope of the mountain in the S. E. ¼ of N. W. ¼ of S. 33, T. 17, R. 2 W., shows up about as follows:

Section of "Big Vein" in the S. E. ¼ of N. W. ¼ of S. 33, T. 17, R. 2 W.

(5)	Debris	
(4)	*Ore*	11 ft. 4 in
(3)	Shale: streak, believed to be only in places.	
(2)	*Ore*: solid	34 ft 1 in
(1)	Shale: yellowish, visible for	6 in.

An average sample of (2) and (4) of this section, a well leached homogeneus ore, full of small rounded flattened siliceous grains, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	52.338
Silica	42.056
Phosphoric Acid	0.670

The "big vein" crops out between Avondale and Lakeview, except opposite the highest points, from 50 to 100 yards down on the south-east side of the mountain. In these outcrops, it appears to be from 18 to 20 feet thick, though its upper 6 to 8 feet, with the exception of a foot or so at its top, is very sandy, much more so than the rest of the seam or its lower 12 to 14 feet. The foot or so at its top is very good ore and is very fossiliferous. Its dip is about 20 deg. to the south-east. There is along here a seam of ore also about 40 feet under the "big vein" as well as one about this same distance over it. The bed of flagstones under this bottom ore seam forms along here the crest of the mountain. These flag-

stones are each 18 inches and more thick. Their dip is from 25 deg. to 30 deg. to the south-east. At the crossing of the Upper Columbiana old road in the N. W. ¼ of S. 5, T. 18, R. 2 W., or in the present "Clifton Gap" there is some thing like the following outcropping:

Outcropping in the N. W ¼ of S. 5, T. 18, R. 2 W.

(6)	*Ore;* the "big vein," about	15 ft.
(5)	Debris; from	12 to 15 ft.
(4)	Sandstones; compact, hard massive and flaggy, ferruginous, and of a greenish yellow color, about	18 ft.
(3)	Shale greenish yellow, about	20 ft.
(2)	Debris; from	18 to 20 ft.
(1)	*Pelham (Trenton) Limestones*	

A big hole has been blasted into this outcrop of the "big vein" [6] of the above section, and the ore gotten out has been piled up along the road. The accompanying Plate XXII is of a photograh of this outcrop and hole. This plate XXII should have been labeled "Outcrop of Red Mountain Seam at Clifton Gap, East Red Mountain." In this hole, the ore has a solid face about 15 feet thick. The floor of the hole is smooth and slippery and appears to be of flaggy sheets of ore that are separated from each other by shale partings. The top surface of this seam of ore is also more or less smooth on the outcrop, though a little porous in places. It is a homogeneous well leached ore with the rounded flattened siliceous grains and with some few brown specks, the last remains of fossils; An average sample of this outcrop gave the following analysis:

Ferric Oxide	55.04
Silica	38.90
Phosphoric Acid	0.93

The above outcropping, or one close to it, furnished the ½ ton lots of respectively the upper middle and lower 5 feet of the Big Seam, of which the following analysis were made. These analyses, labeled: "From the Milner Iron Property between Clifton Junction and Lakeview," were furnished by Dr. W. B. Phillips.

	[1]	[2]	[3]
Moisture.......	1.82	0.87	2.05
Silica..........	34.30	34.00	52.80
Oxide of Iron...	60.22	46.44	41.35
Phosphorus.....	0.26	0.30	0.22
Lime..........	—	5.15	—
Metallic Iron...	42.16	32.51	28.95

(1) Upper 5 feet. (2) Middle 5 feet. (3) Lower 5 feet.

On the Clifton Dummy Line, as it passed over Red Mountain about in the S. W. ¼ of S. 6, T. 18, R. 2 W., there is an outcropping of about 14 feet of ore. This ore, well leached and full of the large flattened rounded siliceous grains, has in it some brown specks, the last remains of fossils. An average sample of its full thickness, dried at 100 deg. C., gave the following analysis:

Ferric Oxide..............	55.35
Silica....................	36.27
Phosphoric Acid..........	1.23

The following analyses by Dr. W. B. Phillips are o the upper 9 feet of the ore outcropping at the west en of the bridge over the B. M. R. R. in Lone Pine Gap.

	[1]	[2	[3]	[4]	[5]
Iron [Metallic]..	41.30	45.00	44.70	44.00	46.50
Insoluble Matter.	36.50	34.60	31.80	33.80	29.80
Water..........	1.00	0.50	0.40	0.60	0.60

[1] Nine inch gouge on top of soft ore. [2] Next 2 feet or first 2 et under gouge. [3] Next 2 feet or second 2 feet under gouge.] Next 2 feet or third 2 feet under gouge. [5] Next 2 feet or urth 2 feet under gouge.

To the south-west for some 10 miles, the "Big or Red Mountain Seam"crops out in many places as a bluff some 5 feet high along the north-west crest of the mountain. Plate XIV is of a photograph of one of these outcrops. This bluff has now however for the most part been cut own or quarried until its ore has become too heavily overed to be surface mined or from a few feet to some 50 feet on the dip to where the cover is from 15 to 25 et thick, Plates XV, XXIII, XXIV, and XXV are of hotographs of the worked outcrops.

From the top of this bluff opposite Birmingham, there an plainly be seen 8 iron furnaces and the smoke of 12 hers. There could also be seen from this point the moke arising from 12 to 14 coal mines and from some 500 coke ovens. The lower part of this bluff was in aces weathered out into small rock houses. It was of homogeneous ore with the rounded flattened siliceous rains and with some few fossils. An average sample its full thickness opposite Birmingham gave the folwing analysis:

Ferric Oxide	57.33
Silica	35.97
Phosphoric Acid	1.30

This analysis shows the ore to be quite high in phoshorus.

The following analyses labeled: "Dry, Soft Red, Opening above Behren's Park, were given by Dr. W. B. Phillips:

	[1]	[2]	[3]	[4]	[5]	[6]
Metallic Iron,	37.50	37.30	33.80	33.50	40.00	46.50
Insoluble Matter,	40.70	36.50	30.46	30.00	29.00	29.00
Lime,	0.50	0.50	5.24	5.25	7.20	0.35

[1] Bottom 2 feet or first 2 feet from bottom. [2] Next 2 feet or second 2 feet from bottom. [3] Next 2 feet or third 2 feet from bottom. [4] Next 2 feet or fourth 2 feet from bottom. [5] Next 2 feet or fith 2 feet from bottom. [6] Upper 3 feet.

To the south-west, at *Green Springs*, there is the following section :

Section at Green Springs.

(9) Deep red loam.
(8) Sandstone, Shale; ferruginous sandstone with yellow shale parting.................15 to 20 ft.
(7) *Ore*; very siliceous with flattened grains, black and often soft and friable, about..........4 ft.
(6) Shale; yellow, about..........................4 in.
(5) *Ore*; stripped for nearly ½ mile (Red Mountain Seam) .... 25 to 30 ft.
(4) Shale; greenish...............................4 in.
(3) Sandstone; ferruginous, may carry streaks of *ore* ....3 to 4 ft.
(2) Shale; yellowish, visible about.............. 5 ft.
(1) Debris.

The upper part of the ore (5) has been analyzed by Dr. W. B. Phillips with the following results :

	(1)	(2)	(3)	(4)
Metallic Iron...........	46.15	45.40	46.10	45.90
Insoluble Matter........	29.40	30.20	29.25	29.70
Water.	2.40	2.60	2.50	2.40

[1] First 6 feet from top or top 6 feet [2] First 8 feet from top or top 8 feet. [3] First ten feet from top or top 10 feet. [4] First 12 feet from top or top 12 feet.

Along the Birmingham Mineral Railroad as it passes through the Walker Gap in the N. W. ¼ of S. 14, T. 18, R. 3 W., there is about the following section :

Section at the Walker Gap in the N. W. ¼ of S. 14, T. 18, R. 3 W.

(17) **Fossiliferous Chert**, visible for from 65 to 70 ft 0 in.
(16) **Black Shale**; Devonian, from ....6 to 8 in.
(15) Sandstone; massive, of a straw color, from ....10 to 12 ft. 0 in.
(14) Shales, Sandstones; the shales are a straw color and the sandstones are in thin flags, about ....40 ft. 0 in.
(13) Shales; of chocolate and pinkish colors, about....................................10 ft. 0 in.
(12) Shales; of a straw color, about.............15 ft. 0 in.
(11) *Ore*, Shales, Debris; from...........10 to 15 ft. 0 in.
(10) *Ore*; sandy, from..... ....16 to 18 ft. 0 in.
(9) *Ore*, Shale; in alternate strata of 4 to 6 each in thickness........................ 18 ft. 0 in.
(8) *Ore*; "Big or Red Mountain" seam, about 30 ft. 0 in.
(7) Sandstones; impure argillaceous and calcareous flags from 4 to 6 inches each in thickness, with some shaly partings of same rock of a grayish blue color with a greenish tinge, about...... ....25 ft. 0 in.
(6) *Ore*; a soft black sandy ore with shaly partings... ....3 ft. 0 in.
(5) Sandstone, Shale; of a straw or yellow ochreous color, about.......... ....15 ft. 0 in.
(4) Shale; from.. ....4 to 5 ft. 0 in.
(3) Sanndstone; of a yellow ochreous color, from.................................5 to 6 ft. 0 in.
(2) Shale; yellowish, visible for about........15 ft. 0 in
(1) Debris.

Of the above section, [8] dips about 20 deg. to the south-east and [2] about 10 deg. to the south-east.

The "Red Mountain or Big Seam in the Pioneer Red Ore Mines on the north-east side of Grace's Gap in the N. W. ¼ of S. E. ¼ of S. 15, T. 18, R. 3 W., is from 25 to 30 feet thick, though only its upper 10 feet is worked. It is here worked by headings running in a general north-east direction almost on the water level. The farthest heading has reached about 1000 feet from the outcrop in the gap, being in *soft* ore for about 200 feet.

This ore on the outcrop is a *soft*, friable, velvety black ore with the flattened rounded grains and some few imperfect fossil impressions. An average sample of it from the dirty outcrop in the railroad cut, on being dried at 100 deg. C., gave the following analysis:

Ferric Oxide	63.26
Silica	29.32
Phosphoric Acid	0.41

The upper half, 9 to 12 feet thick, the better part, of the "Big or Red Mountain Seam" has been surface dug or quarried for some 100 feet on the dip, or until the cover became 20 or 25 feet thick, from Grace's Gap to Reeder's Gap, a distance of between 10 and 12 miles, with the exception of a few hundred yards in one or two places. This upper or better half of the "Big or Red Mountain Seam" with an average in its soft ore of 46 to 47 per cent. of matallic iron and about 23 per cent. of silica in about 2 miles to the south-west and thus divides the seam into two distinct benches or seams. The lower of these benches in 4 to 5 miles farther to the south-west or at about the Woodward Mines becomes in places so badly cut up by the shale partings as to be of no value, though to the north-east of these mines, between them and Grace's Gap, its soft ore has, according to Dr. W. B. Phillips, about 40% metallic iron to 38% silica.

The upper part of this *Big Seam* is in many places a soft, friable well leached purplish red ore that is called "*gouge*." This gouge is from a few inches to some 4 feet thick and is usually the best part of the seam or the highest in iron. It is usually separated from the main body of the seam by a thin parting of yellowish clay or weathered clayey shale. This clay or weathered clayey shale occurs also as thin partings in the underlying ore. This underlying ore is said to increase in silica as gone

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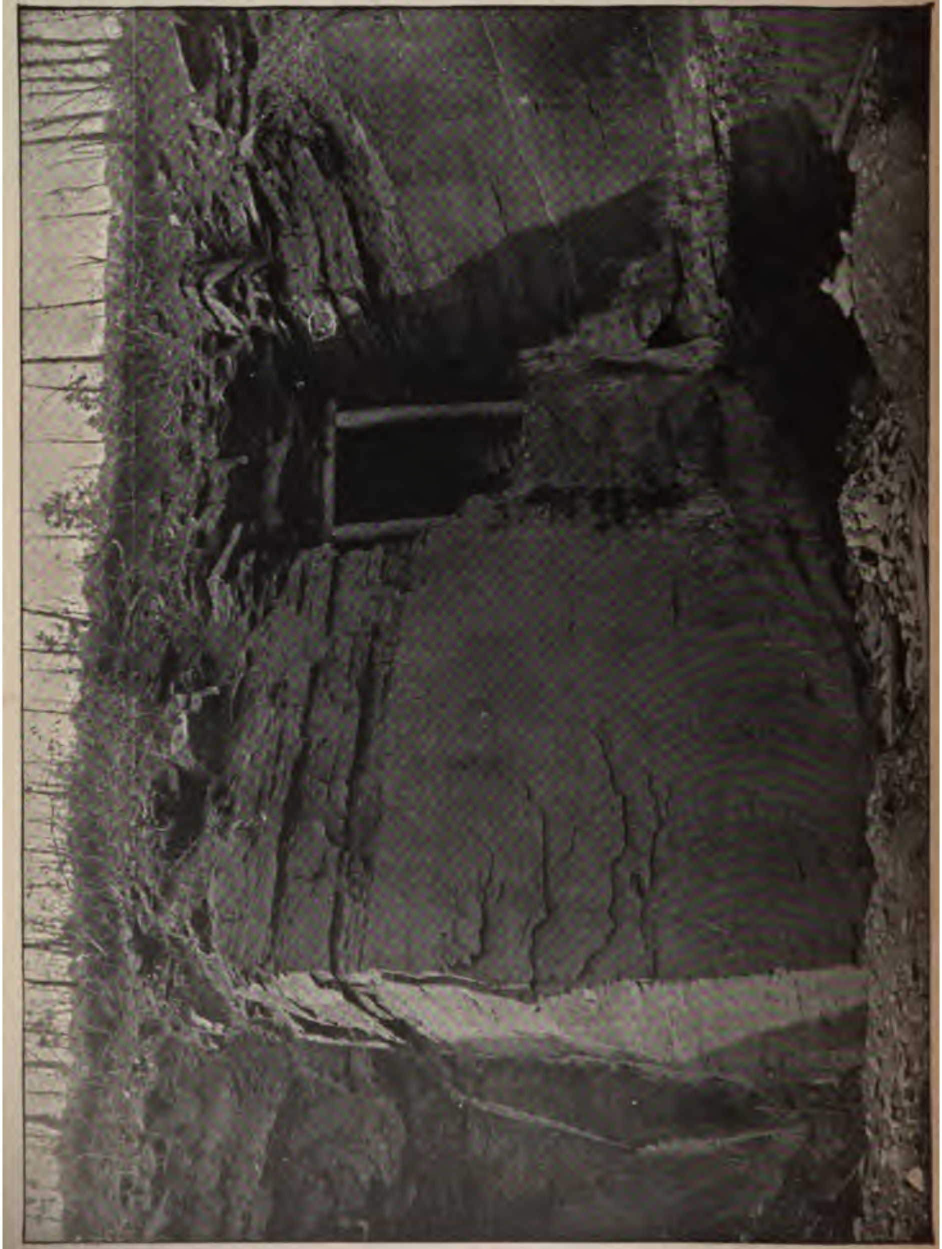

down into, vertically. Dr. W. B. Phillips puts this increase of silica at one-half of one per cent. for every foot of vertical descent into the ore or he says that if the best quality of gouge carries 50 per cent. of iron the ore 10 feet below the gouge will carry 46 per cent. of iron. This increase in the silica as you go down vertically on the ore is said to apply to the hard ore as well as the soft ore.

The upper 9 to 12 feet of the "Big or Red Mountain Seam" between the above two gaps furnished most of the ore that raised the Alabama output of pig iron from about 28,000 tons in 1876 to over 854,000 tons in 1895. Besides the almost continuous line of surface diggings or quarries on it, it has in it some 18 to 20 underground mines of slopes and entries with headings. About one-half of these mines or those on the south-east side of the mountain, are worked by gravity, the loaded cars and balance cars in their descent being made to pull up the empty cars, while the other half, or those on the north west side of the mountain, use steam for hoisting purposes. The extensive surface diggings or open pits in many places are well worth seeing. The contractors prefer the surface work to the underground mining, because more work can be gotten out of the same number of hands. The Red Mountain (Big) Seam in the surface mines or cuts on its outcrop is shown in the accompanying Plate XXIII and also in Plates XV, XXIV and XXV.

Though the ore seams or the Red Mountain Strata of Alabama are the same in no two places on the strike but a short distance removed from each other, still the strata of East Red Mountain between Birmingham and Bessemer, where the Clinton ores are the most highly developed of any place in this or any other country, are approximately represented by the following general section :

APPROXIMATE GENERAL SECTION OF EAST RED MOUNTAIN BETWEEN BIRMINGHAM AND BESSEMER.

	FORT PAYNE CHERT (SUB-CARBONIFEROUS)	
	BLACK SHALE (DEVONIAN)	0 to 1 ft.
(18)	Iron sandstone; very hard, calcareous below surface	6 to 8 ft.
(17)	Sandy limestones, sandstones, shales	15 to 20 ft.
(16)	Ferruginous sandy limestone; very limy *sandy Ore* beyond point of weathering	30 to 35ft.
(15)	Sandstone	20 to 30 ft.
(14)	Feruginous sandstone; *very sandy Ore*	40 to 45 ft.
(13)	Sandstone	20 to 25 ft.
(12)	*Ore;* sandy	2 to 5 ft.
(11)	Sandstone, *Sandy Ore;* a sandstone with 2 to 20 ft. of its central part a *sandy Ore*	40 to 60 ft.
(10)	*Ore*, Shales; principally siliceous ore with interstratified shale, with the *hickory nut* or *gray ore seam*, from 2 to 5 ft. thick near its top and the *Ida Seam*, from 2 to 3 ft. thick, near its bottom	15 to 35 ft.
(9)	Sandstones, Shales	0 to 25 ft.
(8)	*Upper Bench of Big or Red Mountain Ore Seam*	10 to 22 ft.
(7)	Parting	0 to 5 ft.
(6)	*Lower Bench of the Big or Red Mountain Ore Seam*	3 to 14 ft.
(5)	Shales, Sandstones	0 to 36 ft.
(4)	*Ore; Irondale Seam*	3 to 6 ft.
(3)	Sandstones, Shales	25 to 40 ft.
(2)	*Ore;* sandy	3 to 10 ft.
(1)	Sandstones, Shales	75 to 125 ft.
	Pelham (Trenton) Limestones (Lower Silurian)	

The Lower bench of the Big or Red Mountain Seam, the Ida Seam, and the Irondale Seam have also been worked some between Birmingham and Bessemer.

The *Spaulding Mine*, on top of the Mountain on the south-west side of Grace's Gap, consists of only surface diggings or quarrying of the upper 10 feet of the Big or

Red Mountain Seam. This seam here is a well leached ore that is full of small flattened rounded siliceous grains. It cropped out as a bluff some 15 feet high along the north-west crest of the mountain.

An average sample representing the full height of this bluff about ½ mile south-west of Grace's Gap, dried at 100 deg, C., gave the following analysis:

Ferric Oxide	53.033
Silica	43.905
Phosphoric Acid	0.296

No. 1, in the N. W. ¼ of N. W. ¼ of S. 22, T. 118 R. 3 W. is the next mine to the south-west. It is in the upper 10 feet of the Big Seam. Its slope has reached a depth of about 400 feet. Two parallel north-east and south-west faults, about 30 yards apart, have been struck in it. The upper or north-west fault has a displacement of only a few feet; the other one must have a displacement of near 100 feet, though it has not been cut through because of a misunderstanding between contractors and property owners as to who should pay for the dead work. The mine is therefore now being worked only in the open cut or surface digging. It is worked by gravity down the south-east side of the mountain.

The *McIlwain Mine*, some 3000 feet to the south-west, is the next mine to the south-west. Its ore and workings on the outcrop are shown in Plate XV. It is also in the upper 10 feet of the Big seam, which is here about 23 feet thick with a thin shale parting about 16 feet from the top. Some 5 feet under the Big Seam here is the Irondale Seam, 4 to 5 feet thick. Over the Big Seam here, there is a black ferruginous sandstone with partings of dark and yellowish shales for some 125 feet to the Sub-carboniferous Chert. A new slope that has reached a depth about 200 feet, is being sunk here.

East 2 or old Eureka No. 1, in the S. W. ¼ of N. E. ¼ of S. 21, T. 18, R. 3 W., is the next mine to the south-west. Its ore is all soft ore of the upper 10 feet of the Big Seam, though its output of 52 cars per day is the largest of any ore mine in Alabama. It is worked by gravity by means of a balance car, as at Sloss No. 2 only a large car holding the ore of four mine cars is used instead of a carriage car. Several irregular pockets of a coarse grain ferruginous sandstone, sometimes spongy, has been met with in this mine. It extends down into the ore cutting out the ore more or less, though in striping the ore these pockets are passed over without being observed. There is here at this mine about the following section:

Section at E. 2 or old Eureka No. 1 in the S. W. ¼ of N. E. ¼ S. 21, T. 18, R. 3 W.

(6)	"*Ida Seam*"; poor ore, about	2 ft.
(5)	Ferruginous sandstone	16 ft.
(4)	"*Big Seam*"; Solid ore, upper 10 feet better ore than lower 12 feet, about	22 ft.
(3)	*Ore*; Shale in interstratified thin seams, about	5 ft.
(2)	Shale golden about	0 ft. 8 In.
(1)	"*Irondale Seam*"; reported to be good ore and to be	1 ft.

The accompanying Plate XXIV is a view of a portion of these mines on the outcrops.

This mine furnished the first red ore which went to revolutionize the iron industry in Alabama or to make the first coke iron that was ever made in Alabama. This first coke iron was made at the Eureka Company furnaces, Oxmoor, in 1872. Mr. L. H. Goodrich was connected with that company and the following section by him, taken from the State Geologist's

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report for 1876, page 39, was most probably taken at the Eureka Mine No. 1. It is stated in the above report that Mr. Goodrich recognized in Red Mountain, near Oxmoor, two distinct seams of ore, separated from each other by about 16 feet of ferruginous sandstones that the upper of these two seams is about 2 feet thick and is not known to have in it any considerable amount of ore fit for use; and that the lower or workable seam below, the 16 feet of ferruginous sandstones underlying the upper seam, is made of a different strata of ore with interbedded thin bands of shale. The section of this lower or workable seam, the "big vein", as given in the above report, is as follows:

Section of "Big Vein" Opposite Oxmoor by Mr. L. S. Goodrich.

[13]	*Ore*	7 ft. 3 in.
[12]	Shales, Pebbles	trace.
[11]	*Ore*	8 ft. 0 in.
[10]	Shales	3 in.
[9]	*Ore*	2 ft. 3½ in.
[8]	Shale	¾ in.
[7]	*Ore*	8 ft. 2 in.
[6]	Shale	1¼ in.
[5]	*Ore*	1 ft. 2½ in.
[4]	Shale	2 in.
[3]	*Ore*	11 in.
[2]	Shales	7 ft. 0 in.
[1]	*Ore*	1 ft. 3 in.

The ores of the seven strata, (1), (3), (5), (7), (9), (11) and (13) of the above section, as stated in the above report, were carefully collected by Mr. Goodrich and the following analyses were made of them by Dr. Otto Wuth, of Pittsburg, Penn. The numbers of these analyses correspond to the numbers in the above section.

	[1]	[3]	[5]	[7]
Silica	16.73%	31.91%	31.16%	31.83%
Alumina	2.01	4.05	4.64	4.46
Peroxide of Iron	66.84	60.32	59.87	60.51
Lime				
Magnesia				
Phosphoric Acid	0.38	0.45	0.43	0.45
Sulphur				
Carbonate of Lime				
Metallic Iron	46.79	42.22	41.91	42.36

	[9]	[11]	[13]
Silica	32.04%	31.62%	16.31%
Alumina	5.13	4.16	3.76
Peroxide of Iron	59.97	62.45	78.55
Lime		1.03	0.68
Magnesia		0.34	0.21
Phosphoric Acid	0.45	0.42	0.49
Sulphur			trace
Carbonate of Lime			
Metallic Iron	41.98	43.71	54.98

No. 2 or *old Eureka No. 2*, some 1900 feet to the south-west or in the N. E. ¼ of S. W. ¼ of S. 21, T. 18, R. 3 W. is the next mine to the south-west. This mine is also called the "Ishkooda Mine," though the "Ishkooda Mines," as commonly understood, mean the seven mines, from the Spaulding to the Smythe inclusive. Only the hard ore of the upper 10 to 12 feet of the Big Seam is now worked at this No. 2 mine. This hard ore remains about constant down to the end of the slope which has reached a depth of about 1800 feet on the dip, the deepest slope on Red Mountain. The dip at

the end of the slope is about 20 deg. to the south-east. There are 22 headings along this slope. The mine is worked partly by gravity and partly by steam, steam being used for hoisting purposes. It is worked through a drift some 600 feet long that sets in near the south-east foot of the mountain. Where this drift strikes the ore, the ore is hard and has a cover from 75 to 100 feet thick. The section here is about the same as at E. 2 or *old Eureka No. 1*, except that the bottom or "Irondale Seam" is said to be only 2 feet 6 inches thick. The Big Seam is covered here also in places by about 2 feet of the porous coarse grain ferruginous sandstone. The full thickness, 22 feet, of the seam has been worked some in the surface diggings, The following is a section of the outcrop, taken by Dr. W. B. Phillips:

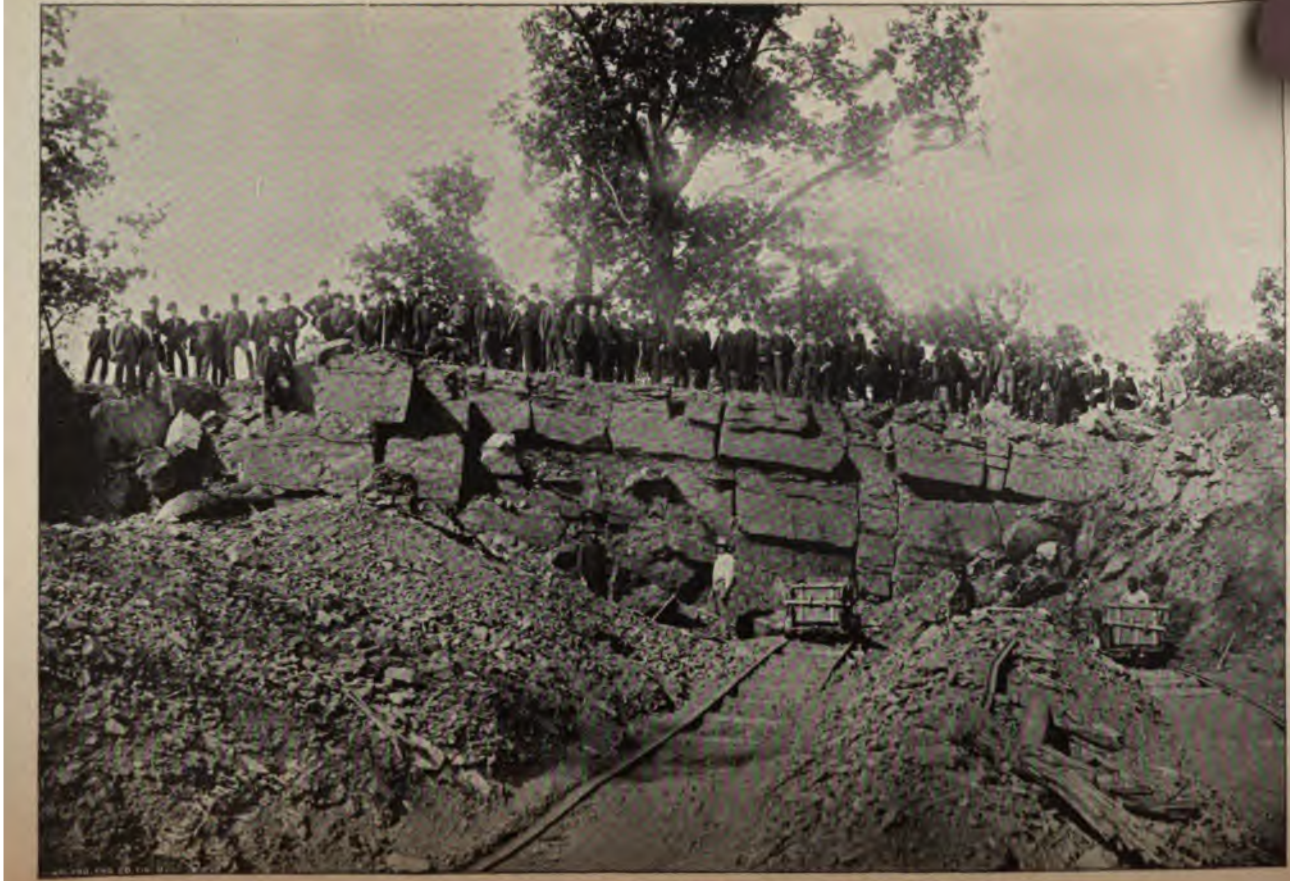
Outcrop at No. 2 or Ishkooda Mine.

(53)	Red Clay	6 ft.
(52)	Sandstone with a couple of thin clay partings	4 ft. 3 in.
(51)	*Ore*	6 in.
(50)	Clay	2 in.
(49)	*Ore*	3 to 4 in.
(48)	Clay	1 in.
(47)	*Ore*	4 in.
(46)	Clay	4 in.
(45)	*Ore*	4 in.
(44)	Clay	½ in.
(43)	*Ore*	1 ft. 1 in.
(42)	Clay	2 in.
(41)	*Ore*	10 in.
(40)	Clay	1 in.
(39)	*Ore*	2 to 3 in.
(38)	Clay	½ in.
(37)	*Ore*	½ in
(36)	Clay	1 in
(35)	*Ore*	2 in.
(34)	Clay	½ in.
[33]	*Ore*; fine grain	2 in.

[32]	Clay	2 in.
[31]	*Ore*; fine grain	1 ft. 4 in.
[30]	Slate	½ in.
[29]	*Ore*; fine grain	5 in.
[28]	Clay	1 in.
[27]	*Ore*; fine grain	7 in.
[26]	Slate	1 in.
[25]	*Ore*; fine grain	4 in.
[24]	Slate	2 in.
[23]	*Ore*; sandy	1 in.
[22]	Slate	1 in.
[21]	*Ore*; sandy	2 in
[20]	Slate	1 ft. 0 in.
[19]	*Ore*; sandy	6 in.
[18]	Slate	1 in.
[17]	*Ore*; sandy	7 in.
[16]	Slate	1 in.
[15]	*Ore*; limy	2 in.
[14]	Slate	½ in.
[13]	*Ore*; limy	2 in.
[12]	Slate	½ in
[11]	*Ore*; limy	8 in.
[10]	Clay	½ in.
[9]	*Ore*; sandy	6 in.
[8]	Slate	3 in
[7]	*Ore*; sandy	3 in.
[6]	Slate. *Ore*; slate with sandy ore infusion	6 in.
[5]	*Ore*; sandy	1 in.
	Clay; a mere seam.	
[4]	*Ore*; sandy	3 in.
[3]	Slate	1 in.
[2]	Sandstone	6 in.
[1]	*Ore*; Big Seam, top 10 feet mined	22 ft. 0 in.

The clay partings are doubtless the weathered outcrops of yellowish argillaceous shales. The dip of the Big Seam is 19 deg. to the south-east. Plates XXIII and XXV are of photographs of this mine on the out-crop.

The following analyses are of carefully selected average samples of the ores at this mine:



EUREKA: No. 2 OR No. 2 MINES ON OUTCROP JEFFERSON COUNTY, ALABAMA.

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ASTOR, LENOX
TILDEN FOUNDATIONS

[illegible] ores from [illegible] Mine No. 2.
[illegible] N. E. ¼ [illegible] T [illegible] R. [illegible] W.

ed at 135 deg. C	1	2	(3)
oxide of Iron	[illegible]	[illegible]	58.111%
ca	22.271	14.179	11.907
bonate of Lime		22.[illegible]	13.865
sphoric Acid	.[illegible]44	0.925	0.776
determined	[illegible]	11.791	12.841
otal	100.000	100.000	100.000
allic Iron	4[illegible].512	35.748	40.678
sphorus	0.259	0.404	0.230

A well weathered or leached ore with rounded flattened flinty
[illegible] A soft ore An average sample of full thickness of "Big
[illegible] surface diggings. Locality: Eureka Mine No. 2.
A compact limy ore with the rounded flattened flinty pebbles.
bbes are few in most of it A [illegible]: from head of drift,
long, and from under a cover 75 to 80 feet thick An aver-
ple of the upper 12 feet of the "Big Seam" Locality:
Mine No. 2.
An average sample of the seam 2 feet 6 inches thick about 4
ler the Big Seam, the Irondale Seam" A compact ore that is
arge rounded siliceous grains. Some of the grains are large
to be called pebbles and some of them are flattened. Local-
ureka Mine No. 2.

following analysis of soft and red hard ores at No.
ureka No. 2, were furnished by Dr. W. B Phil-

	(1)	(2)	(3)	(4)
lic Iron	49.09	41.51	13.72	39.68
	13.21	10.12	11.71	12.40
horus	0.60	0.43	0.41	0.62
	0.20	11.31	9.15	12.32
	5.94	0.65	0.60	1.75

The 3 feet of soft red ore on top of [illegible]
Hard red ore from 1st heading [illegible]

(3) Hard red ore from 1st and 3rd headings on both the right a left.

(4) Hard red ore from the bottom heading on Aug. 2nd, 1893.

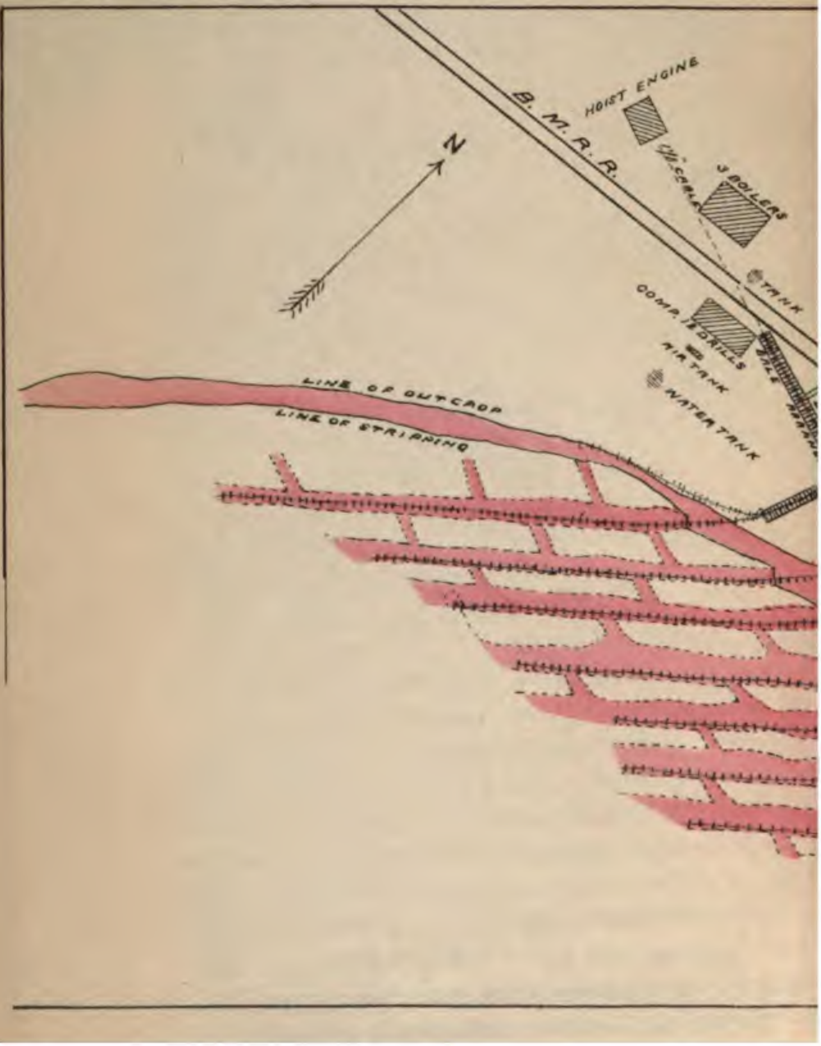
West 2, some 1200 feet still farther to the south-wes is the next mine to the south-west. It is in the upp 10 feet of the Big Seam and is worked entirely by gra ity. Here, the *hickory-nut seam* is about 28 feet over t Big Seam.

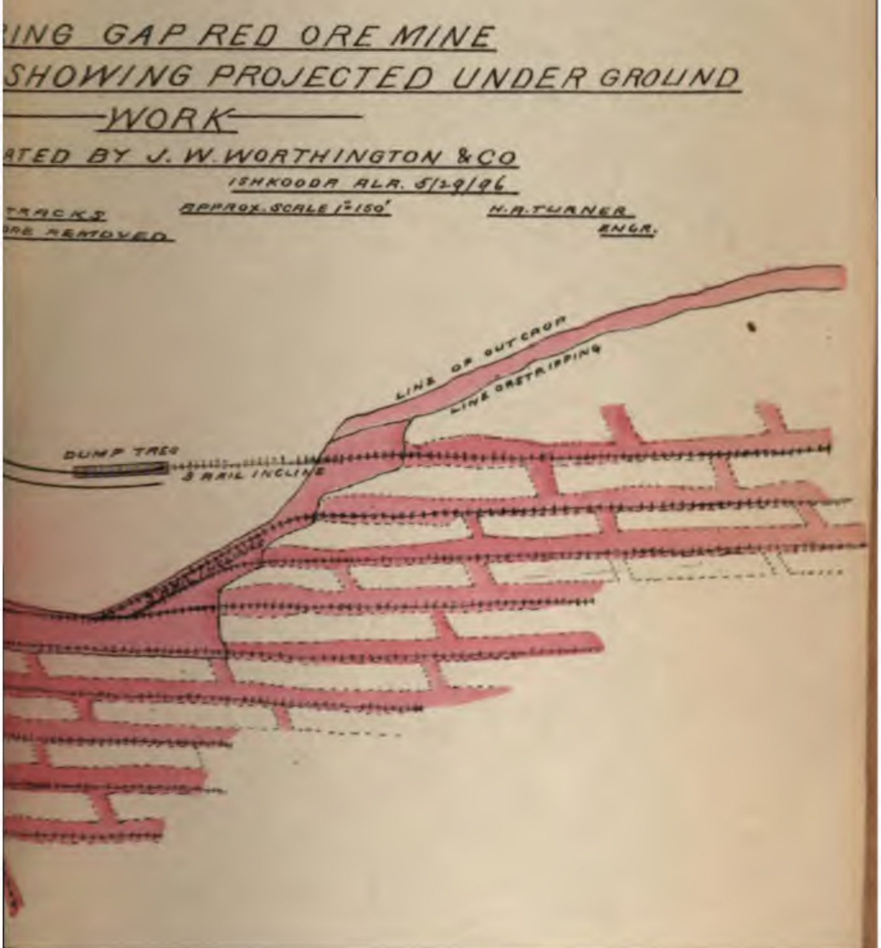
The *Smythe Mine*, the next mine to the south-west some 3000 feet from West 2. It is worked by gravi and is in the upper 6 feet or upper bench of the B Seam which is here about 22 feet thick with a sha parting, less than ¼ inch thick, that thickens towar the south-west. The lower bench is not as good ore the upper bench, though its top 2 feet is of very go ore. The *Hickory-Nut Seam*, 4 to 5 feet thick, is he about 30 feet over the Big Seam, and over the Hickor Nut Seam there are about 100 feet of sandstones, shal etc., to the Sub-carboniferous Chert.

The last mentioned seven mines, those to the sout west of Grace's Gap, the "Ishkooda Mines" had an ou put of 376,469 long tons of iron ore for 1894.

The *Spring Gap Mine*, in the N. E. ¼ of N. W. ¼ S. 29, T. 18, R. 3 W., is the next mine to the south-we It is the first mine to the south-west of Grace's Gap th is on the north-west side of the mountain. It is in t upper bench, here 8 feet 8 inches thick, of the Big Sea The ore slips well along the parting, ¼ inch thick, givi a clean foot wall. It was hard and self fluxing from t start and has remained about the same down to the he of the slope about 300 feet on the dip from the outcro The slope does not run exactly down the pitch or dip b with the vertical joints in the ore, because these join add much to the ease and cheapness of driving the slo By following these joints rather than the dip of the o

GEOLOGICAL SURVEY OF ALABAMA.




ING GAP RED ORE MINE
SHOWING PROJECTED UNDER GROUND
WORK
ATED BY J. W. WORTHINGTON & CO
ISHKOODA ALA. 5/29/96
TRACKS
ORE REMOVED
APPROX. SCALE 1"=150'
H. A. TURNER
ENGR.
LINE OF OUTCROP
LINE ORE STRIPPING
DUMP TRES
3 RAIL INCLINE

the slope loses in steepness about 7 feet in 100 feet. This mine is a model of its kind. The slope, extending from joint to joint in the ore is about 6 feet broad. It is cut down into the under bench until it is about 20 feet high or until its large cars, holding 4 mine cars of ore, are low enough to permit of the mine cars being dumped into them from the side headings. The large cars are hoisted by steam and dumped automatically into a bin over a large crusher. The ore falls from the crusher into the railroad cars standing on a side track. Plate XXVI is of the projected underground work at this mine. The lines of outcrop and stripping, or the stripping shown on this plate embraces the top of the mountain.

The *Redding Mines Nos. 2 and 1*, are the next mines to the south-west. The are in the upper bench of the Big Seam, though the lower bench was worked some in the open cuts or surface diggings. The section here is about as follows:

Section at Redding Mines.

(6)	Sandstones, Shales; ferruginous sandstones and yellow shales.	
(5)	*Ore;* siliceous, about	1 ft. 6 in.
(4)	Sandstones, Shales; like (6), about	75 ft.
(3)	*Ore*; upper bench of Big Seam, about	10 ft.
(2)	Shale; yellowish, parting	6 to 8 in.
(1)	*Ore*; lower bench, about	12 ft.

Neither of these mines is now being worked. The slope of the southwest one, Redding No. 1, in the S. E. ¼ of S. 30, T. 19, R. 3 W., has reached a depth of some 1200 feet on the dip. The dip is about 25 deg. to south-east. Its ore was all *hard* or limy with the exception of the top 18 inches at the depth of 600 to 700 feet, where the cover was about 100 feet thick. The following analysis are of average samples of its ore:

Analyses of Ores from the Redding Mine, near the Center of S. E. ¼ of S. 30, T. 18, R. 3 W.

Dried at 135 deg. C.	(1)	(2)	(3)
Peroxide of Iron	63.760%	83.557%	55.046%
Silica	29.007	13.925	10.684
Carbonate of Lime			25.825
Phosphoric Acid	1.132	1.297	0.643
Metallic Iron	44.632	58.490	38.532
Phosphorus	0.494	0.566	0.281

(1) A well leached ore with some few rounded and flattened grains and with some yellowish brown specks, the last remains of its fossils. A *soft* ore. An average sample of the upper bench of the "Big Vein" on the outcrop. Locality:—The Redding old Mine.

(2) A well leached ore with the rounded and flattened grains. A *soft* ore. An average sample of the upper bench of the "Big Vein" down on the slope nearly 600 feet from the outcrop and with about 75 feet of cover over it. Locality:—The same as (1).

(3) A *hard* or limy ore with the rounded and flattened grains. An average sample of the upper bench of the "Big Vein" at the head of the slope on April 29, 1887, about 700 feet from the outcrop on the dip and with about 100 feet of cover over it, where it is all *hard* or limy with the exception of the top 18 inches. Locality:—The same as (1) and (2).

The soft and hard ores of the Lower Bench of the Big Seam at the Redding Mine No. 1, gave, according to Dr. W. B. Phillips, the following analysis:

(a) *Analyses of dried samples of Soft Ore from the Lower Bench of the Big Seam at Redding No. 1:*

	Metallic Iron.	Insoluble Matter.
[1] Top or first 3 feet below the 8 inch parting	46.72%	29.09%
[2] Next or 2nd 3 feet below parting	44.84	31.66
[3] Next 1 foot below parting	43.16	37.55
[4] Next 1 " " "	39.40	40.62
[5] Next 1 " " "	37.61	43.85

[6] Next 1 " " "	40.05	39.72
[7] " 10 inches below parting......................	39.62	40.64

[b] *Analyses of dried samples of the Hard Ore from the Lower Bench of the Big Seam in Slope No. 1 at Redding:*

	Metallic Iron.	Insoluble Matter.	Lime.
[1] Top or first 5 ft. 9 in. in 1. A heading...............	36.90%	20.00%	13.60%
[2] Next 3ft. 4in. in 1. A heading.......	33.10	29.00	4.00
[3] Top or first 3ft. 7in. in 2. A heading	40.60	22.00	9.00
[4] Next 3ft. 2in. in 2. A heading......	34.60	21.50	14.00
[5] Top or first 3ft. 9in. in 2. B heading	38.90	19.30	12.00
[6] Next 3ft. in 2. B heading.........	29.80	21.20	17.60

The *Ware Mine*, on the south-east side of the mountain about in the N. E. ¼ of N. W. ¼ of S. 31, T. 18, R. 3 W., is the next mine to the south-west. At this mine the upper bench of the Big Seam is about 12 feet thick, the parting about 13 inches thick, and the lower bench about 10 feet thick. In this mine, several irregular pockets of *soft ore* and also of limonite so it is said have been struck, surrounded by *hard ore*. It is said that the limonite with the exception of one pocket some 25 x 20 x 10 feet was in thin sheets of botryoidal ore, that in places extended through nearly the full thickness of the upper bench, and in small globular masses. An average sample of the hard ore of the lower bench of this mine, taken from the heading on Aug. 3, 1893, gave according to Dr. W. B. Phillips, the following analysis:

Silica	11.34%
Metallic Iron	47.88
Phosphorous	0.51
Alumina	1.76
Lime	6.27
Moisture	1.00

The *Fossil Mine*, about 1400 feet to the west of the Ware Mine, is on the opposite or north-west side of the mountain. It is in the upper bench about 9 feet thick, of the Big seam. The parting here is about 1 foot thick and the lower bench 9 to 10 feet thick. This mine has reached a depth of about 1500 feet on the dip. Its ore remains about the same though flattened some. The following section on the outcrop was made by Dr. W. B. Phillips:

Section of Outcrop at Fossil Mine.

[47]	Red Clay	4 ft. 0 in.
[46]	Sandstone	26 ft. 0 in.
[45]	Sandstone, Clay; sandstone with clay partings	14 ft. 10 in.
[44]	*Ore*	2 ft. 0 in.
[43]	*Ore*; sandy	3 ft. 0 in.
[42]	Clay	3 in.
[41]	*Ore*; sandy	1 ft. 6 in.
[40]	Clay	2 in.
[39]	*Ore*; sandy	1 ft. 0 in.
[38]	Clay	1 ft. 0 in.
[37]	*Ore*. sandy	3 in.
[36]	Clay	3 in.
[35]	*Ore*; sandy	1 ft 0 in.
[34]	Clay	3 in.
[33]	*Ore*	9 in.
[32]	Clay	2 in.
[31]	*Ore*; sandy	1 in
[30]	Clay	6 in.
[29]	*Ore*; sandy	2 in.
[28]	Clay	3 in.
[27]	*Ore*; sandy	1 ft. 0 in.

[26]	Clay	2 in.
[25]	*Ore*	9 in.
[24]	Clay	1 in
[23]	*Ore*	2 in.
[22]	Clay	5 in.
[21]	*Ore*	5 in.
[20]	Clay	8 in.
[19]	*Ore.*	8 in.
[18]	Clay	6 in.
[17]	*Ore;* sandy	2 in.
[16]	Clay	1 in.
[15]	*Ore*; sandy	1 in.
[14]	Clay	1 in.
[13]	*Ore*; sandy	4 in.
[12]	Clay	2 in.
[11]	*Ore*; fair	2 ft. 0 in.
[10]	Clay	5 in.
[9]	*Ore*	6 in.
[8]	Clay	2 in.
[7]	*Ore*; gouge, top of Big Seam	3 ft. 0 in.
[6]	Clay	1 in.
[5]	*Ore*	6 ft. 4 in.
[4]	Clay; parting in Big Seam	1 ft. 5 in.
[3]	*Ore;* lower bench, the bottom 4 feet under track	9 ft. 0 in.
[2]	*Ore*, Clay; in interstratified thin seams	8 ft. 0 in
[1]	Shale; yellow	26 ft. 0 in.

The clay partings doubtless correspond to the weathered outcrops of yellowish argillaceous shales.

The following analyses of the hard and soft ores of this mine were furnished by Dr. W. B. Phillips:

	[1]	[2]	[3]	[4]
Metallic Iron	41.67 per cent.	51.38 per cent	43.62 per cent.	46.28 per cent.
Silica	19.06 per cent.	17.72 per cent.	18.81 per cent,	18.96 per cent.
Phosphorous	0.38 per cent,	0.58 per cent.	0.91 per cent,	0.69 per cent.
Alumina	0.19 per cent.	0.24 per cent.	....	...
Lime	trace	0.20 per cent,	trace	0.20 per cent.
Water	11.09 per cent.	4.66 per cent,	5.55 per cent,	1.10 per cent.

	[5]	[6]	[7]	[8]
Metallic Iron	26.50 per cent.	11.03 per cent.	31.51 per cent.	46.28 per cent,
Silica	7.86 per cent.	12.92 per cent,	8.86 per cent.	7.00 per cent.
Phosphorous	0.24 per cent,	0.63 per cent,	0.51 per cent.	0.12 per cent.
Alumina	0.79 per cent.	1.38 per cent.	....	.....
Lime	26.09 per cent.	11.18 per cent,	29.72 per cent.	9.29 per cent.
Water	0.18 per cent,	0.60 per cent,	0.65 per cent,	0.70 per cent,

(1) Soft red ore of Upper Bench, top or first 4 feet 6 inches from surface.

(2) Soft ore of Upper Bench, second 4 feet 6 inches from surface.

(3) Soft ore of Lower Bench, first or top 4 ft. 6 in. from parting.

(4) Soft ore of Lower Bench, second 4 feet 6 inches from parting.

(5) Hard ore of Upper Bench in 2nd heading, top or first 4 ft. 6 in.

(6) Hard ore of Upper Bench in 2nd heading, second 4 feet 6 inches.

(7) Hard ore of Upper Bench in 22nd heading, top or first 4 ft. 6 in.

(8) Hard ore of Upper Bench in 22nd heading, second 4 feet 6 inches.

The *Alice Mine*, in the N. E. ¼ of S. W. ¼ of S. 36, T. 18, R. 4 W., is the next mine to the south-west. At this mine the strata on the outcrop are badly broken and mixed up, some of them being about vertical while others have a dip of not over 20 to the south-east. An approximate section of these outcrops is about as follows:

Outcropping at the Alice Mine in N. E. ¼ of S. W. ¼ of S. 36. T. 18, R, 4 W.

(10) *Ore;* a very siliceous gray ore, a ferruginous sandstone, with a parting of shale about 18 inches thick, about.....	23 ft.
(9) Sandstone, Shales; in places squeezed down to 18 inches.....................	3 to 5 ft.
(8) *Ore;* very siliceous, called *perpendicular seam* and also *shiny seam*; its better or upper 3 to 4 feet, the portion above a thick shale parting, corresponds doubtless to the *Ida Seam*, from..	15 to 20 ft.
(7) Sandstones, Shales; about...............	8 ft.
(6) *Ore;* a Siliceous gray ore of very irregular thickness with two partings of shale each 2 feet thick, from............ ...	30 to 35 ft.
(5) Sandstones, Shales...	15 to 20 ft.
(4) *Ore;* Big Seam with an 18 inch parting, about................	23 ft.
(3) Shales, Sandstones, reported to be about.	50 ft

(2) *Ore;* reported	12 ft.
(1) Shales; bluish and yellowish	

The ore (6) is called the *horse-shoe* seam, because it has extending down into it in the shape of a horse-shoe a point of *barren* or *dead* rock. Its section is about as follows:

Section of Horse-shoe Seam.

(5) *Ore;* about	2 ft.
(4) Shale	2 ft.
(3) *Ore*	12 ft.
(2) Shale	2 ft.
(1) *Ore*	15 ft.

The ore of (1), (2), and (5) appears to be of about the same quality. (1) has been worked some here. An analysis is given of it below.

The Big Seam, (4) of the above section, has about 11 feet of ore in both its upper and lower bench with a parting of about 18 inches, between the benches. The upper 4 feet of the upper bench is on the outcrop a soft gouge that becomes hard within the mines like the rest of the seam.

The ores (3), (6), and (2) of the above section have been worked some here but only the upper bench of the Big Seam is now worked. This bench has been mined to a depth of from 800 to 1000 feet on the dip. Its *hard ore* was struck at different depths in different headings but has remained about the same. Its dip however flattened at about 600 feet from the outcrop from about 30 deg. to 10 deg. to the south-east. This flattening is doubtless mostly due to a wave in the strata. If so, the dip will increase as the crest of the wave is passed over. The following analyses are of average samples of the ore at this mine:

Analyses of Ores from the Hillman (Alice) Mines, in the N. E. ¼ of S. W. ¼ of S. 36, T. 18, R. 4 W

Dried at 125 deg. C.	(1)	[2]	[3]	4
Peroxide of Iron	69.661 per ct.	56.779 per ct.	63.086 per ct.	77.544 per ct.
Silica	23.551 per ct.	28.894 per ct.	31.997 per ct.	16.039 per ct.
Phosphoric Acid	0.496 per ct.	0.218 per ct.	0.406 per ct.	0.403 per ct.
Carbonate of Lime	......	......	......	......
Total	93.708 per ct.	95.891 per ct	95.489 per ct.	93.986 per ct.
Metallic Iron	46.762 per ct.	39.755 per ct.	44.160 per ct.	54.280 per ct.
Phosphorus	0.218 per ct.	0.097 per ct.	0.177 per. ct	0.175 per ct.

	5	6	7
Peroxdie of Iron	67.983 per ct.	54.938 per ct.	70.669 per ct.
Silica	26.997 per ct	14.128 per ct	26.264 per ct.
Phosphoric Acid	0.559 per ct	0.772 per ct.	0.247 per ct
Carbonate of Lime	......	22.791 per ct.	....
Total	95.489 per ct	92.629 per ct.	97.170 per ct.
Metallic Iron	47.553 per ct.	38.457 per ct.	49.468 per ct.
Phorphorous	0.244 per ct.	0.336 per ct.	0.108 per ct

(1) A good looking ore with but few of the rounded grains. An average sample of the hanging or upper bench of the *perpendicular* or *shiny* seam, (8) of the above section, supposed to be the "Ida Seam." Locality:—Hillman Mines,

(2) A well leached homogeneous ore with small rounded grains and a few fossil shells. An average sample of the lower bench of the *perpendicular* (*shiny*) seam or of (1). Locality:—Same as(1)

(3) A compact good looking ore with but few of the large flattened grains and with a few fossils. An average sample of the lowest of the three benches of the seam (6) of the above section. Locality:—Same as (1) and (2).

(4) A well leached ore with comparatively few of the large rounded grains. It has a few fossils and many yellowish brown specks, the last remains of fossils. A good *soft* ore. An average sample of the upper bench of the "Big Vein," (4) of the above section. Locality:—Same as (1), (2), and (3).

(5) A tolerably well leached ore with the rounded grains comparatively few and small. An average sample of the lower bench, on the outcrop, of the "Big Vein," (4) of the above section. Locality: Same as above.

(6) A hard limy ore with some fossils and the flattened rounded grains. A *hard* ore. An average sample of the upper bench of the "Big Vein," (4) of the above section, about 200 feet down on the dip from the outcrop. Locality:—Same as the above.

7) A uniform ore that is full of the flattened rounded grains. An rage sample or the bottom or "Irondale Seam," (2) of the above tion. Locality:—Same as the above.

The *Woodward Mines*, the next mines the south-west, tend for some ⅞ miles along the mountain. At the rth-east end of these mines, the upper and lower nches of the Big Seam are respectively 10 and 7 feet thickness with a 10 inch parting between them. The ver bench here is also very good ore, and so both nches are worked. At the south-west end of the mines at the *Tanyard Gap* in the S. E. ¼ of S. E. ¼. of S. 2, 19, R. 4 W., where the principal mine is located, ere is something like the following outcropping:

cropping at Woodward Mine (Tan-yard Gap) in the S. E. ¼ of S. E. ¼ of S. 2, T. 19. R 4 W.

(13) *Ore;* very sandy, a ferruginous sandstone, loose over top of mountain.	
(12) *Ore;* like (13), about	20 ft. 0 in.
(11) Sandstone; yellowish, about	3 ft. 0 in.
(10) *Ore;* the *Ida Seam*, about	3 ft. 0 in.
(9) Sandstone; yellow, about	10 ft. 0 in.
(8) *Ore;* very siliceous, about	3 ft. 0 in.
(7) Sandstone; yellow, about	8 ft. 0 in.
(6) *Ore;* very siliceous, about	2 ft. 10 in.
(5) Sandstones, Shales; about	25 ft. 0 in.
(4) *Ore;* upper bench of *Big Seam*, about	11 ft. 0 in.
(3) Shale; parting, about	3 ft. 6 in.
(2) *Ore;* lower bench of *Big Seam*, about	4 ft. 4 in.
(1) Shale, *Ore;* the ore in thin seams in top strata.	

The Ida Seam is worked some here, the only place w. Here it is merely surface worked, about ⅛ of the e charges at the Woodward Furnaces being of it. e lower bench of the Big Seam is also worked some here, but the main workings are in the upper bench of the Big Seam. The top 15 inches of this upper bench on the outcrop is a soft gouge. Its *hard* ore begins at about 40 feet on the dip and then remains about constant to the head of the slope, now about 360 feet on the dip. The general south-east dip however flattens from about 34 deg. on the outcrop to 28 deg. at head of slope. A north-east and south-west fault with a displacement of about 12 feet has been struck in this mine. The following analyses are of good average samples of the ores at this mine.

Analyses of Ores from the Woodward Mines,
in the S. E: ¼ of S. E. ¼ of S. 2, T. 19, R. 4 W.

Dried at 100 deg. C.	[1]	[2]	[3]	[4]
Peroxide of Iron...	55.975 %	73.758 %	53.566 %	70.174 %
Silica	38.290	17.261	17.687	23.064
Phosphoric Acid...	0.230	0.415	0.673	0.477
Carbonate of Lime......	......	......	16.121	......
Total..........	94.495	91.424	88.047	93.715
Metallic Iron.....	39.183 %	51.630 %	37.496 %	49.122 %
Phosphorus.......	0.100	0.181	0.294	0.208

(1) A compact siliceous looking ore, principally a fine grain ore though some of it has the large flattened rounded grains. An average sample of the "gray ore," (6) of the above section. Locality:—Woodward Mines.

(2) A fossiliferous ore with a few of the large flattened rounded grains. A well leached or *soft* ore. An average sample of the upper bench of Big Seam. Locality:—Same as (1).

(3) A hard ore that appears to be slightly limy with spots of almost pure calcite and with the large flattened rounded grains. An average from the upper bench of Big Seam, about 160 feet down on the slope or dip from the outcrop. Locality:—Same as above.

4) A homogeneous ore with the large flattened rounded grains ttered through it. An average sample of the lower bench of Big m, (2) of the above section. Locality:—Same as above.

The *Sloss Mines No. 1* or the *Sloss Lower Mines* are the xt mines to the south-west. They had an output in 94 of 85, 878 tons of ore. There are two of these nes. The north-east one, in the N. E. ¼ of N. W. ¼ S. 11, T. 19, R. 4 W., is not worked now. At the th-west one, in the S. E. ¼ of N. W. ¼ of S. 11, T. 19, 4 W., there is something like the following outcrop-ng:

Section at Sloss Lower Mines,

in the S. E. ¼ of N. W. ¼ of S. 11, T. 19, R. 4 W.

[8] *Ore;* the "*gray seam*" capping the mountain, visible.....................................5 ft. 6 in.
[7] Sandstones, Shales; the shales are ferruginous, about...............................8 ft. 0 in.
[6] *Ore;* the "*Ida Seam*", about ....6 ft. 0 in.
[5] Sandstones, Shales; the sandstones are ferruginous in which the shales occur as partings from 1 to 18 inches thick, about...........10 ft. 0 in
[4] *Ore;* the upper bench of Big Seam, here called "*Red Mountain Seam*," about...........14 ft. 0 in.
[3] Sandstones; becomes shaly on weathering, of a greenish yellow color.....................4 ft 8 in.
[2] *Ore*; the lower bench of Big Seam, the upper 15 inches is siliceous, reported to be.. 3 ft. 10 in.
[1] Sandstones; flags with smooth sides.

The "*gray seam*" (8) and *Ida Seam* (6) have both been rface dug here, though the only seam that is now work- here is the *upper bench* [4] of the Big Seam. The *y seam* is usually nothing more than a ferruginous ndstone. It has also been worked some at the Alice nes to the north-east. The *Ida Seam* here appears to very uniform. The *lower bench*, [2] of the Big Seam, s about 15 inches from its top an interstratified clay seam about ½ inch thick. The ore over this clay seam is better than that under it.

The *upper bench* [4], the ore that is worked, is about 14 feet thick, though its upper 18 inches, down to a stratified seam, is not worked out but is left as a roof to the mine. The *soft ore* extends to from 80 to 100 feet down on the dip, to where the *hard ore* becomes solid. This distance is due to the imperviousness of cover, or to the thickness of the cover and its freedom from water seams. The change from the well leached *soft ore* to the *hard limy ore* is often very sudden or within a few feet, though the two ores along this line of change are interlocked somewhat like saw teeth. Patches of *soft ore* are also found in places down in the *hard ore* or surrounded by the *hard ore*. There was also found in the *hard ore* of this mine two irregular boulders of almost pure limestone extending down from the roof. The *hard* ore has remained about constant from the time it set in down to the head of the slope, now about 850 feet on the dip. The dip flattens and gets steeper in places, because of long flat waves with a general north-east and south-west trend in the strata. At the depth of about 600 feet on the dip, the seam began to flatten in a general way and continued to flatten for about 100 feet when it changed from a dip of only about 10 deg. to one of 35 deg. to the south-east. This great change was due to the passing over the crest of a greater wave with a north-east south-west trend in the strata.

The following analyses are of the uniform hard ore, about 350 feet down in the slope from the outcrop, and of the soft ores in the upper bench and other ore seams on and near the outcrop at this mine;

Analyses of Ores from the Sloss Lower Mines in the S.E. ¼ of N. W. ¼ of S. 11, T. 19, R. 4 W.

Dried at 100 deg. C.

	[1]	[2]	[3]
Peroxide of Iron	50.430%	54.416%	68.902%
Silica	46.265	40.804	12.753
Phosphoric Acid	0.016	0.108	1.395
Carbonate of Lime			0.665
	96.711	95.328	83.715
Metallic Iron	35.301	38.091	48.231
Phosphorus	0.007	0.047	0.609

	[4]	[5]
Peroxide of iron	37.064%	67.807%
Silica	16.700	23.136
Phosphoric Acid	0.736	0.540
Carbonate of Lime	38.164	......
	92.664	91.483
Metallic Iron	25.945	47.465
Phosphorus	0.321	0.238

[1] A thoroughly leached siliceous ore, full of imperfect impressions of fossils. It resembles a very red burnt brick and has a very red powder. An average sample of the outcrop of the "*gray seam*", [8] of the above section. Locality: Sloss Lower Mine.

[2] A leached or soft non-uniform ore. Some of it is of alternate seams or layers of the large flattened rounded grains and of fine grains, and some of it, looking siliceous, is altogether of the fine grains. An average sample of the "*Ida Seam*," [6] of the above section. Locality: Same as [1]

[3] A very fossiliferous homogeneous ore, without the flattened rounded grains. An average sample of the *soft* ore in the mine, of the upper bend [4] of the above section. Locality: Same as above.

[4] A *hard* or limy ore with the flattened rounded grains. Thin sheets of shale in some of it. An average sample of the upper bench, [4] of the above section, about 350 feet down in the slope from the outcrop. Locality: Same as above.

[5] A homogeneous ore with the flattened rounded grains smaller than usual. An average sample of the outcrop of the lower bench, [2] of the above section. Locality: Same as above.

The following analyses were given by the Superintendent at the mines as the working analyses or as [the analyses of the ores by the car loads as they were sent to the furnaces. Each of them is said to be the mean of 10 different analyses of 10 different average samples taken from the ore piles at 10 different times under 10 different conditions, they therefore ought to truly represent the quality of the ores as near as can be done so by analyses:

Working Analyses of Ores from the Sloss Lower Mines, in the S. E. ¼ of N. W. ¼ of S. 11, T. 19. R. 4 W.

	[1]	[2[	[3]
Metallic Iron	52.415%	39.315%	41.790%
Phosphorus	0.260	0.341	0.302
Silica	17.01	11.010	38.410
Lime		15.320	4.070

(1) Of average samples of *soft ore* of the Upper Bench of Big Seam.

(2) Of average samples of *hard ore* of the Upper Bench of Big Seam.

(3) Of average samples of "Ida Seam" near the outcrop.

The Sloss Iron and Steel Company kindly furnished the following section of a bored hole 1200 feet south-east of the ore outcrop here at their mine, Slope No. 1, and also the analyses of the ore core.

Section of Bored Hole about 1200 Feet South-east of Slope No. 1, "Sloss," Alabama.

Fort Payne Chert.

[21]	Sandstone; red, coarse grit	6 ft.
[20]	Sandstone; soft, gray, coarse grit	6 ft.
[19]	Limestone; hard, gray, cherty	7 ft.
[18]	Limestone; ferruginous	33 ft.
[17]	Sandstone; ferruginous	3 ft.

[16]	Sandstone; extremely hard, gray	25 ft.
[15]	Sandstone; ferruginous	43 ft, 3 in.
[14]	Sandstone; very hard, reddish, fine grit	21 ft. 6 in.
[13]	*Iron Ore*; limy	2 ft. 8 in.
[12]	Sandstone; gray	8 ft. 6 in.
[11]	Limestone; "marbleized"	1 ft. 6 in.
[10]	Sandstone; hard, gray	2 ft.
[9]	Limestone; ferruginous	6 ft.
[8]	Sandstone; ferruginous	22 ft. 4 in.
[7]	*Iron Ore*	15 ft.
[6]	Sandstone; gray	2 ft. 6 in.
[5]	Slate; ferruginous	9 in.
[4]	*Iron Ore*; limy	2 ft. 6 in.
[3]	Sandstone: highly ferruginous	4 ft. 9 in.
[2]	Sandstone; highly ferruginous, fossiliferous, mottled	1 ft. 3 in.
[1]	Calcareous Rock, Slate; a gray calcareous rock interstratified with sandstone and slate	31 ft. 9 in.

The bottom of the above bored hole is believed to be within less than 35 feet of the bottom of the Red Mountain (Clinton) Formation.

In the above section of the bored hole, the ferruginous limestone (9) must correspond to the *Gray Ore Seam*, the middle portion of the ferruginous sandstone (8) to the *Ida Seam*, the iron ore (7) to the ore that is being mined or the *Upper Bench* of the *Big Seam*, the limy iron ore (4) to the *Lower Bench* of the *Big Seam*, and the ferruginous sandstones (3) and (2) to the *Irondale Seam*. This section shows that there is here no Black Shale (Devonian) and that the Red Mountain (Clinton) strata are nearly 300 feet thick with five seams of ore, counting the two benches of the Big Seam as one seam, though two of these seams are regarded in the section of the bored hole as merely ferruginous sandstones and one as a merely ferruginous limestone.

The following analyses of the Iron Ore core (7) corresponding to the *Upper Bench* of the Big Seam, were made by C. D. Hancock, Chemist of Sloss Iron and Steel Company.

Dried at 100 deg. C.	[1]	[2]	[3]	[4]
Silica	9.32	11.26	13.82	11.18
Alumina	2.22	2.92	3.44	2.94
Carbonate of Lime	36.13	32.26	34.92	34.92
Phosphorus	.35	.33	.28	.33
Metallic Iron	37.14	37.29	35.96	36.89

(1) Top 4 feet. (2) Middle 4 feet. (3) Bottom 4 feet. (4) Whole Seam.

The above analysis (4) of the whole seam or ore core, (7) of the above section, makes the percentage of metallic iron in the whole seam, (7) of the above section of bored hole, 10.84 per cent. greater than the analysis already given of a section of the hard ore 350 feet down on the dip in the mines and 2.42 per cent. less than the working analysis, already given, of car load samples of the hard ore at about this same depth of 350 feet on the dip.

The *Muscoda Mines*, three in number, are the next mines to the south-west. They are all three in the Upper Bench of the Big Seam, and on the north-west side of the mountain.

The *Muscoda Mine No. 3*, the most north-east one, is some 3000 feet to the south-west of the Sloss Lower Mine. The whole of the upper bench, from 10 to 13 feet thick, is mined here. Its slope has reached a depth of about 350 feet on the dip. The mine is all in *soft ore* with the exception of the end of the slope and one heading. It is all of 275 feet down the slope to the solid *hard* ore and in some of the headings the *soft* ore extends down even farther than this. The great depth to which the *soft ore* extends in this mine is due to a ravine or hollow up in the mountain on its south-east side.

It is said that the parting in the Big Seam is about 2 feet thick here and that the lower bench is of no value.

The *Muscoda Mine No. 2*, the middle mine, is some 1500 feet still farther to the south-west. In this mine 10 to 12 feet of the upper bench is taken out while its upper 18 inches, down to a stratified seam or thin shale parting, is left as a roof. This top ore makes such a good roof that it requires props only about every 40 feet. The *hard ore* was struck in this mine within 100 feet of the outcrop and has remained about constant down to the head of the slope about 600 feet on the dip. Only *hard ore* is therefore mined here.

The *Muscoda Mine No. 1*, the most south-west mine, is some 1200 feet still farther to the south-west. It is some 300 yards to the north-east of Reeder's Gap or in the S. E. ¼ of N. E. ¼ of S. 15, T. 19, R. 4 W. All of the top bench about 13 feet thick of the Big Seam, is mined here. The solid *hard ore* starts in this mine in about 150 feet of the outcrop and stays about the same to the head of the slope about 350 feet down on the dip.

The Muscoda, Ware and Fossil mines had a combined output for 1894 of 304,867 long tons of ore.

The *T. C. I. & R. R. Co. Mine* is the next mine to the south-west. The incline and drum of this mine is in Reeder's Gap, though the slope, connected by tramway, near the top of the mountain, is some ¼ mile to the south-west. At the mouth of the slope, there is something like the following outcropping:

Outcropping at T. C. I. & R. R. Co. Slope in N. W. ¼ of S. 22, T. 19, R. 4 W.

(8)	*Ore*; *Ida Seam*, siliceous	3 to 4 ft.
(7)	Sandstones, Shales	25 to 30 ft.
(6)	*Ore; upper bench of Big Seam*	8 to 10 ft.
(5)	Shale, Sandstone; parting, nearly	2 ft.
(4)	*Ore*; hard ledge of good ore that weathers at bottom into kidney looking nodules	6 in.

(3)	*Gouge;* a loose black ferruginous stuff	1 ft.
(1)	*Ore;* black and sandy, about	3 ft.
(1)	Shale; yellow and gray, visible	6 to 7 ft.

The upper bench (6) is the only ore that is worked here. The under bench, with the exception of its top 6 inches or ledge [4], is of no value. This mine has not been worked much because, it is said, of an agreement between the company and certain contractors to furnish them with ore. The ore of this mine however has been stripped for nearly 100 feet on the dip from Reeder's Gap to some 200 yards to the south-west of the slope. Since the above was written this mine has been connected with the B. M. R. R. by a branch railroad and is now doubtless being worked.

Some 1800 feet still further to the south-west, the Pioneer Mining and Manufacturing Company are said to have sunk a slope on the Upper Bench, 8 feet thick. This slope is said to be in *soft ore* for over 400 feet. This is because the slope is under a ravine. The upper 18 inches of ore is left for a cover. There is said to be no plane of division between the ore and covering rock.

To the south-west, in places at least, the upper bench of the Big Seam also becomes cut up by shale partings and the two benches also come together again.

An outcropping of ore about 3 feet 3 inches thick about one and one-fourth miles to the south-west or in the S. W. ¼ of S. E. ¼ of S. 21, T. 19, R. 4 W., is probably of the upper bench. It may be only a part of the lower portion of this upper bench. Still farther to the south-west, some ½ mile, this ore is only 2 feet 9 inches thick. It appears as if this ledge of ore, believed to belong at the bottom of the upper bench of the Big Seam and in places to make all of the big seam, gets still thinner to the south-west, though more ore comes in both over and under it. That over it is especially cut up by shale partings.

On the north-east side of Spark's Gap in the south-east corner of S. 29, T. 19, R. 4 W., there is a test pit with about the following section:

Section of Test-pit on North-east Side of Spark's Gap.

(15)	Shale, Sandstone; visible	10 to 12 ft.
(14)	*Ore*	1 in.
(13)	Shale	½ in.
(12)	*Ore*	8 in.
(11)	Shale	½ in.
(10)	*Ore*	4 to 5 in.
(9)	Shale	¾ in.
(8)	*Ore*	3 in.
(7)	Shale	½ in.
(6)	*Ore*	1 to 2 in.
(5)	Shale	¼ in.
(4)	*Ore*	2 ft.
(3)	Shale	¼ in.
(2)	*Ore;* weathered into kidney looking nodules at bottom	10 in.
(1)	Shale; just visible.	

There may be more ore under [1] as there is on the southwest side of the gap. The ore [4] of the above section, here only about 2 feet thick, is the solid ledge that to the north-east makes the lower part of the upper bench and in places all of the upper bench or even all of the Big Seam. This ledge is still thinner or is only 1 foot 6 inches thick on the south-west side of the gap. It corresponds to [6] of the following outcropping:

Outcropping on South-west Side of Spark's Gap in the North-east Corner of S. 32, T. 19, R. 4 W.

[17]	Shale, Sandstone; visible about	10 ft.
[16]	*Ore*	1 to 2 in.
[15]	Shale	¾ in.
[14]	*Ore*	¾ in.
[13[	Shale	1 to 2 in.
[12]	*Ore*	7 to 8 in.
[11]	Shale	½ in.
[10]	*Ore*	2 to 3 in.
[9]	Shale	½ in.
[8]	*Ore*	1 in.
[7]	Shale	½ in.
[6]	*Ore*	1 ft. 8 in.

[5]	**Shale**	**⅛ in.**
[4]	***Ore*; weathering into kidney nodules at the bottom**	**1 ft. 1 in.**
[3]	**Shale; may carry some *ore***	**3 to 4 in.**
[2]	***Ore***	**1 ft. 10 in.**
[1]	**Shale.**	

This ore has been worked some by the T. C. I. & R. R. Co. A section of it by Mr. P. H. Haskell is as follows:

[9]	***Ore***	**6 in.**
[8]	**Shale; thin.**	
[7]	***Ore***	**6 in.**
[6]	**Shale; thin.**	
[5]	***Ore*; with knife edge of shale**	**28 in.**
[4]	**Shale; thin.**	
[3]	***Ore*; kidney ore**	**3 to 4 in.**
[2]	**Shale; thin.**	
[1]	***Ore***	**26 in.**

The ores of this last section, dried, have been analyzed with the following results, as given by Dr. W. B. Phillips:

Ore.	Met. Iron.	Insol. Matter.	Phosphorus.
(9)	48.00%	26.70%	0.15%
(7)	47.60	27.91	0.11
(5)	52.20	21.21	0.11
(3)	47.80	28.25	0.06
(1) 2nd Drift	34.04	42.50	0.14
(1) 1st Drift, Lower Rib	38.80	47.82	0.14
(1) 1st Drift, Upper Rib	34.60	45.50	0.15

The numbers of ore [analysis] correspond to numbers in section.

A second seam of ore, several feet thick, is reported to be here at Spark's Gap. To the south-west of this gap about ½ mile and then on to the south-west for some

¾ mile or to the south-west of Cow Gap [Clear Creek Gap], the strata of this formation are more or less engulfed in a fault. To the south-west of the Cow Gap, there are two seams of ore that are believed to correspond to the Big and Irondale seams. The Ida Seam, it is believed, also occurs here in places. These seams however vary very much in thickness and composition. They are believed to be workable in only a few places. The Ida Seam in the N. W. ¼ of S. E. ¼ of S. 6, T. 20, R. 4 W. is a solid ledge from 15 inches to 2 feet thick. Its bottom 6 to 8 inches is very good ore. An average sample of this ledge gave the following analysis:

Ferric Oxide	57.45%
Silica	33.28
Phosphoric Acid	0.159

Analyst:—J. L. Beeson.

Just under this ledge, there are several feet of interstratified thin seams of ore and shale. Some 60 feet lower down on the side of the mountain, there is an outcropping of an other seam that shows here only as some loose boulders in clay. The Big Seam, as it is believed, in an outcrop in the S. W. ¼ of S. E. ¼ of S. 12, T. 20, R. 5 W., is sandy and only 18 inches thick, but in a couple of hundred yards farther to the south-west, it is of excellent quality and is from 8 to 10 feet thick. There is also here a few feet over this ore, a good ore, seemingly several feet thick, that breaks up principally in slabs.

To the south-west, in the N. W. ¼ of S. E. ¼ of S. 22, T. 20, R. 5 W., and then on to the south-west at intervals to the county line, there are outcrops of two seams of ore, believed to be the Big and Irondale seams. The upper of these outcrops are reported to be of a good seam of ore some 3 feet thick. The lower ones are of a seam that is not so thick.

The remnant of the central belt of this formation in the north-east part of the county is a high broad broken mountain that extends to the south-west down into this county several miles, as a loop around the south-west end of Blount Mountain. In it, the rocks of this formation are highly developed. Over the top of this high mountain in the N. W. ¼ of S. 8, T. 15, R. 1 E., there are loose pieces of good ore. The dip here is 25 deg. to 30 deg. to the north-west. A high peak of this mountain to the south-west, in the N. W. ¼ of S. 8. T. 15, R. 1 E., is called the "Button Mountain", from the abundance on it of sections of large crinoidal stems that have a fancied resemblance to buttons. Near the foot of this mountain on the north-west side, there is, in the S. E. ¼ of S. 11, T. 15, R. 1 W., on both sides of a ravine, outcrops of ore. The outcrop on the north-east side of the ravine shows to a thickness of only about 12 inches and is bent over to the north-west until it has a dip of about 60 deg. to the south-east. The cover to this outcrop is a yellowish shale. On the opposite side of the ravine or some 200 yards to the south-west, the ore outcrop in about 42 inches thick and has in it, near its bottom, one or two thin streaks of shale. Its cover and underbed is a yellowish shaly sandstone. This outcrop is bent over towards the north-west until its dip is about 80 deg. to the south-east. It is well leached, though a few of its fossils are still visible. An average sample of it gave the following analysis:

Ferric Oxide	72.676
Silica	14.597
Phosphoric Acid	0.193

Analyse, J. L. Beeson.

The above two outcrops are just to the south-east of a north-east and south-west fault. From the opposite side of the mountain from these outcrops or from the the south side of the mountain in S. 14, T. 15, R. 1 W., there extends out from the mountain in a SSW. direction for a couple of miles a very broken broad spur that is made up of a series of high peaks or cone-like mountains that are known as the *Cedar Mountains*. The two tallest and most north-western of these Cedar Mountains are capped with the rocks of this formation.

In circling around the end of Blount Mountain, the mountain or the rocks of this formation form a broad rounded point. In this broad point, on both sides of a hollow or ravine, in the N. W. ¼ of N. E. ¼ of S. 15, T. 15, R. 1 W., there are outcrops of at the least two seams of ore. At one of these outcrops, there is about the following section:

Outcropping in the N. W. 1-4 of N. E. 1-4 of S. 15, T. 15, R. 1 W.

[8]	Sandstones, Shales; the sandstones are flaggy	
[7]	Loam; red, may lead back to *Ore*	3 in.
[6]	Shale	2 in.
[5]	*Ore*; soft	6 in.
[4]	*Ore*; good	12 in.
[3]	Shale	2 in.
[2]	*Ore*	14 in.
[1]	Sandstones; flaggy and yellow.	

The dip of this outcrop appears to be about 15 deg. to the north-east. Across the hollow from this outcrop or on the south side of the hollow, the ore outcrop is near the top of the mountain. Along the bed of the hollow or ravine between these outcrops, there are some loose flagstones with their sides a mere network of *fucoids*. These fossils project at the least ½ of an inch above the general surface of the rocks and more than this where they cross each other. In this hollow, near the middle of the northern boundary of S. 15, T. 15, R. 1 W., the dip is from 25 deg. to 30 deg. to the ENE. Just to the north of this broad rounded point, there is a very low gap in the mountain where the rocks of this formation appear to be partly engulfed in a fault. In a short distance to the north of the gap, however, the mountain is again tall and the rocks of this formation are well developed and have in them some 3 seams of ore. Of these ore seams, the top one is only from 6 to 8 inches thick, the middle or main one is from 2 feet 6 inches to 3 feet thick, and the bottom one is a thick though very impure or sandy seam. In a hollow in the mountain just north of the above low gap, there is an outcrop of ore as a ledge about 14 inches thick. Along a wash at the head of an other hollow, in the western part of the S. W. ¼ of N. W. ¼ of S. 11, T. 15, R. 1 E., there shows for some distance an outcrop of a seam of good ore that is said to be about 18 inches thick, though the solid ledge along the gully is only about 12 inches thick. Its dip is about 35 deg. to the ESE. This same ore also crops out some 225 yards to the west on the opposite or steep side of the mountain, and here, some 10 to 12 feet under it, there is an outcrop of an other ore seam that is reported to be 4 feet thick. At some old diggings on the outcrops of these two seams in the S. E. ¼ of N. E. ¼ of S. 10, T. 15, R. 1 E., there is something like the following section:

Outcropping in the S. E. ¼ of N. E. ¼ of S. 10, T. 15, R. 1 E.

[7]	Debris; to top of mountain, about	20 ft. 0 in.
[6]	*Ore;* good	6 in.
[5]	Debris; about	12 ft. 0 in.
[4]	*Ore;* seemingly about	10 in.
[3]	Debris; believed to cover shale and *soft ore*	6 to 8 in.

[2]	*Ore;* about	2 ft. 0 in.
[1]	Debris.	

In an old test pit some 200 yards to the north, the lower of the above two ore seams or the ore of [2] to [4] inclusive of the above section, shows about as follows;

[4]	*Ore;* showing badly, believed to be about	6 in.
[3]	Debris; from	5 to 6 in.
[2]	*Ore;* with some yellow shale streaks near the middle	42 in.
[1]	Debris.	

The dip in this old pit is about 15 deg. to the east. Farther to the north, in the eastern part of S. 3, T. 15, R. 1 W., the middle or main ore seam is said to be from 20 to 33 inches thick

The smooth or water worn rounded loose pieces of red ore that occur scattered over the (c) Siliceous [Knox] Dolomite and Chert ridges, especially the south-east ridges, from East Lake to Woodward, are believed to be mostly at least, remnants of this central belt that once extened clear through the county from north-east to south-west in the broad unsymmetrical synclinal of the valley. With the loose red ore on several of the high points of the Cemetery Ridge, near its south-east edge and south-west end, there are patches of bedded, though badly broken up sandstones and red ore that are partly of this formation, though some of them may belong at the bottom of the Pelham [Trenton] Limestones. The strata of one of these patches have in them the fossils of this formation. This patch in which fossils have been seen is on top of the high ridge of the narrow unsymmetrical synclinal that branches off from the broad unsymmetrical synclinal of the Cemetery Ridge about north-west of Powderly or some ¾ mile south-west of the Fair Grounds. Its strata appear to be about vertical and just north-west of a big fault. The steep south-east side of this high ridge is of [b] Coosa [Flatwood] Shales and Limestones and its more sloping north-west side is of [c] Siliceous [Knox] Dolomite and Chert. To the north-west of this high ridge or between it and the Cemetery Ridge, there is a narrow pointed valley of the top of a broken or faulted unsymetrical anticlinal with outcrops of [a] Montevallo [Variegated] Shales and Sandstones. To the north-west of the point of this narrow valley or in the Cemetery Ridge in the S. E. ¼ of S. E. ¼ of S. 12, T. 18, R. 4 W., and seemingly just on top of the [c] Siliceous [Knox] Dolomite and Chert, there is an other one of these bedded outcrops of red ore. It is a mass of oolitic grains. To the south-west, in these cherty ridges in the N. E. ¼ of N. E. ¼ of S. 23, T. 18, R. 4 W., there is an other of the patches of bedded sandstones and red ore. It caps the top of a high cone-like hill. Its ore is of good quality and its sandstones are partly red or ferruginous and partly of a yellow ocherous color. In a test pit on the north-east side of this hill, there is something like the following outcropping:

Outcropping in the N. E. ¼ of N. E. ¼ of S. 23, T. 18, R. 4 W.

(4)	Debris; loose *ore* and loam.	
(3)	*Ore;* of good quality, flaggy with thin yellow shale partings, about	2 ft.
(2)	*Ore;* of good quality, massive about	5 ft.
(1)	*Ore;* sandy, the top just visible.	

The good ore, [2] and [3], is a mass of oolictic grains and small pebbles. This outcrop appears to be in the trough of a shallow narrow wave with a north-west and south-east trend. The sandstones over the hill are of very light weight or are well leached.

Still farther to the south-west, in the Knox chert ridges in the S. E. ¼ of N.W. ¼ of S. 23, T. 18, R. 4 W., there is still an other patch of the bedded sandstone and red ore. These rocks are in place though they are even worse broken up than those of the last outcropping, Their loose pieces cover the surface and in them there has been dug a long test trench. Commencing at the south-east end of this trench, there shows in it; first, a massive ferruginous sandstone with large oolitic grains; then, a sandy ore or a ferruginous sandstone of the oolitic grains; then, a boulder of this sandy ore, about 2 feet 6 inches thick, that appears to be of about the thickness of its seam; then, for 10 to 12 feet along the trench, much loose ore in debris; then, along the trench for some 50 feet, debris and loam to more ore, some of which is of good quality and some of it is sandy. Still farther to the north-west, at the north-west end of the trench, the loose ore in a loam can be seen to a depth of 10 to 12 feet. The ore of this north-west end of the trench looks as if it might be of two benches, each about 14 inches thick, separated by about 18 inches of some softer material. The dip looks as if it might be about 45 deg. to the north-west at the north-west end of the trench and about 30 deg. to the north-west near the south-east end of the trench.

To the south-east of the last two outcrops, between them and the south-east edge of the Cemetery Ridge, a distance of not quite ½ mile, there is a great deal of the good loose ore with rounded grains. This ore has an unctuous feeling and is all more or less smooth or water worn. It appears to occur principally along two streaks that run in a north-east and south-west direction. There is also a great deal of this loose good ore here to the south-east of the Cemetery Ridge, scattered over outcrops of Cambrian (Flatwood) strata, about in a south-west line with the above high sharp ridge t was spoken of as being separated from the main Cen tery Ridge by a narrow valley and a fault and havi along its top an outcrop of Red Mountain (Clinto strata. There are other places in which this loose go red ore in smooth or water worn pieces, usually sma lie scattered over outcrops of the Cambrian strata. The also occur scattered over the Knox chert ridges of th south-east side of the valley or over the south-east be of the Birmingham Valley, between Birmingham an Bessemer, of the Siliceous (Knox) Chert and Dolomit Formation. An average sample of 30 to 40 pieces o this loose smooth or water worn ore with rounded flattened grains and an unctuous feeling, picked up from over the cherty ridges near Walnut Grove Church in S. E. ¼ of S. 13, T. 18, R. 4 W., gave the following analysis:

Ferric Oxide	84.845
Silica	9.780
Phosphoric Acid	trace.

Analyst:—J. L. Beeson.

This ore is of very fine quality, as shown by the analysis.

The remnant of the central belt of this formation in the Birmingham Valley in the south-western part of the county is of the *McAshan Mountain* and is continuous with this mountain. This mountain, as has been stated, is of the outcrops of the south-east half of the broad valley synclinal trough that has here its north-west half engulfed in an underthrust strike fault. The outcrops of this formation are along the top and near the top of the mountain. They show in many places the outcrops of the two seams of ore and the loose ore of a third seam, the top seam, that can be seen on West

Red Mountain to the north-west. The middle ore seam or the upper seam of the many visible ore outcrops, crops out along the top of the mountain and is from 30 to 40 feet over the bottom seam that crops out down on the steep south-east side of the mountain. An outcrop of this upper seam makes its appearance in the sloping north-east point of the mountain, in the N. E. ¼ of S. W. ¼ of S. 36, T. 19, R. 5 W. In this outcrop, the good ore is only about 2 feet thick. The strata here are rather broken up. The dip is about 20 deg. to the south-west.

Just to the south-west of the north-east point of the mountain, the outcrops of both seams are to be seen. They show near the center of the S. W. ¼ of S. 36, and in the S. E. ¼ of S. E. ¼ of S. 35, T. 19, R. 5 W. In these outcrops, the upper one is from 6 to 7 feet thick, though only its lower part is good ore, the rest of it being sandy. Its bottom 10 inches is very fine ore, and then its next 20 inches is very soft ore that is dirty on the outcrop and is believed to have in it some shale partings. In these outcrops, the lower seam is about 2 feet thick. Its ore is not so good as the bottom part of the upper seam. Average samples of these outcrops, dried at 100 deg. C., gave the following analyses:

	(1)	(2)
Ferric Oxide..............	71.474	67.596
Silica.....................	21.602	20.405
Phosphoric Acid..........	0.180	1.173

[1] Upper seam. A good looking fossiliferous ore with a scaly appearance, seemingly from pressure, and with the rounded flattened siliceous grains.

[2] Lower seam. A well leached hard cellular ore with brownish specks left in the leaching out of the fossils.

At an outcrop of the upper of these two seams, on the brink of the mountain in the S. E. ¼ of S. E. ¼ of S. 35, T. 19, R. 5 W., there is about the following section:

Outcropping in the S. E. ¼ of S. E. ¼ of S. 35, T. 19, R. 5 W.

[6]	*Ore;* very sandy, a ferruginous sandstone, visible from	10 to 12 ft. 0 in.
[5]	Shale, *Ore*; the shale is yellowish and the ore is very sandy or is a ferruginous sandstone	1 ft. 8 in.
[4]	*Ore;* granular, very good	3 ft. 7 in.
[3]	*Ore*, Loam; the ore is soft and good, though it likely has partings of shale, the loam is red	1 ft. 4 in.
[2]	*Ore*; very fine	10 in.
[1]	Sandstone; very ferruginous, a *sandy ore*, with streaks of yellow shale in its upper part, visible about	20 ft. 0 in.

It is believed that this upper seam, from (2) to (4) inclusive of the above section, is the "Big Vein" of East Red Mountain, and that (6) is the "Sandy Seam," the "Ida Seam", of East Red Mountain. The dip at this outcrop is about 45 deg. to the north-west.

At another outcrop of this upper seam, some 200 yards to the south-west, there is about the following section:

Outcropping in the S. E. ¼ of S. E. ¼ of S. 35, T. 19, R. 5 W.

(7)	*Ore;* very sandy, a ferruginous sandstone, from	4 to 5 ft. 0 in.
(6)	Loam; may cover shale partings, from	3 to 4 in.
(5)	*Ore*; granular	1 ft. 10 in.
(4)	*Ore*; very soft, may have some partings	2 ft. 4 in.
(3)	Loam; clayey, red color	6 in.
(2)	*Ore;* very fine	10 in.
(1)	Sandstone; ferruginous.	

The dip at this outcrop is from 30 deg. to 35 deg. to the north-west.

At an old slope on the south-east crest of the mountain in the N. W. ¼ of N. W. ¼ of S. 2, T. 20, R. 5 W., there is about the following outcropping:

Outcropping at Mouth of an Old Slope in the N. W. ¼ of N. W. ¼ of S. 2, T. 20, R. 5 W.

[a] *on South-west Side of Slope.*

[11]	Sandstone; ferruginous.	
[10]	Shale; yellow, only a few inches thick.	
[9]	*Ore;* a hard solid ledge, it was not worked in this slope	1 ft. 2 in
[8]	Shale; from	0 to 2 in.
[7]	*Ore;* good, soft. top of ore worked in this slope	11 in.
[6]	Shale; yellowish, from	0 to ½ in.
[5]	*Ore;* poor, sandy	5 in.
[4]	Shale; yellow, from	0 to 2 in.
[3]	*Ore;* very good	7 in.
[2]	*Ore;* sandy	8 in.
[1]	Sandstone; ferruginous.	

(b) *On North-east Side of Slope.*

[9]	Sandstone; ferruginous.	
[8]	Shale; yellowish, only a few inches thick.	
[7]	*Ore;* a hard ledge, not worked in this slope	1 ft. 2 and ½ in.
[6]	Shale	Streak.
[5]	*Ore;* good	10 in.
[4]	*Ore*, Shale; from	5 to 6 in.
[3]	*Ore;* good	11 in.
[2]	Shale	2 in.
[1]	Sandstones; ferruginous.	

The ore [5], of this last section, is very soft and is of a dark brown color. The dip at the mouth of this old slope is about 20 deg. to the north-west. The following analyses are of average samples from two different places of the ore that was worked in the above old slope and of the hard ledge just over the worked ore:

Analysis of Ores from near the mouth of the Old Slope in the N. W. ¼ of N. W. ¼ of S. 2, T. 20, R. 5 W.

Dried at 100 deg. C.	[1]	[2]
Peroxide of Iron	77.558%	36.835%
Silica	16.990	60.374
Phosphoric Acid	0.129	0.135

(1) A soft or well leached ore with a scaly look and the flattened rounded grains An average sample, from two different places in the slope, of the ore worked

(2) A well leached granular ore with flattened rounded grains. An average sample from two different places in the slope of the hard ledge just over the ore that was worked.

This old slope was sunk several hundred feet down on the ore and was then abandoned after a heavy expense had been gone to in building a branch railroad, houses, dumps, etc., because, as reported, the good ore became too thin down in the slope to be profitably mined in competition with the much thicker ores of East Red Mountain.

The following complete analysis is of a sample of red ore from McAshan Mountain, doubtless from the outcrop at or near the above old slope:

Specific Gravity	*4.182*
Hydroscopic Moisture	0.700
Combined Water	1.095
Ferric Oxide	86.769
Silica	11.384
Phosphoric Acid	0.159
Manganese Peroxide	0.122
Lime	0.083
Magnesia	0.017
Alumina	0.023
Sulphuric Acid, Anhydrous	0.030
Total	100.380

The McAshan Mountain is taller along here than the West Red Mountain to the north-west. It shows to the south-west, or in the N. W. ¼ of S. E. ¼ of S. 3, T. 20, R. 5 W., another outcropping of the upper of its two visible ore seams. At this outcropping, there is about the following section:

Outcropping in the N. W. 1-4 of S. E. 1-4 of S. 3, T. 20, R. 5 W.

(8) Sandstones; ferruginous, from	4 to 5 ft. 0 in.
(7) *Ore;* sandy and dirty	10 in.
(6) *Ore*; hard ledge, cover to above old slope	2 ft. 6 in.
(5) Shale, *Ore*; mixed	1 ft. 6 in.
(4) *Ore*	1 ft, 1 in.
(3) Shale; from	5 to 6 in.
(2) *Ore;* from	4 to 5 in.
(1) Shale; yellow.	

The ore (4) is very soft. The dip at this outcrop is from 25 deg. to 30 deg. to the north-west. Average samples of the hard ledge (6) of the above section and of the underlying softer ore, dried at 100 deg. C., gave the following analyses:

	(1)	(2)
Ferric Oxide	38.633	73.081
Silica	61.810	21.381
Phosphoric Acid	0.192	0.273

(1) The covering hard ledge (6) of the above section. A well leached sandy ore with rounded flattened siliceous grains and small pebbles.

(2) The ore under hard ledge or of (2) to (5) inclusive of the last section. A well leached soft ore without any hard lumps.

Under the ledge (6) of the last section from 35 to 40 feet, there is a ledge about 10 inches thick of the bottom seam, of very good ore.

About 150 yards to the south-west, on the opposite side of a gap in the mountain, the upper of the two seams shows about as follows:

Outcropping in the N. W. ¼ of S. E. ¼ of S. 3, T. 20, R. 5 W.

(5) Shale, *Ore;* in alternate streaks, the ore is sandy	3 ft. 0 in.
(4) *Ore;* soft	1 ft. 1 in.

(3)	Loam; red	6 in.
(2)	*Ore*	11 in.
(1)	Shale; yellowish.	

Some 35 or 40 feet under this outcrop, there is also t be seen here an outcrop of the under seam that appear to be about 2 feet thick, though it is broken up. It cover is a yellowish shale.

At an old test pit on an outcrop of the upper seam o the top of the mountain in the N. W. ¼ of N. E. ¼ o S. 10, T. 20, R. 5 W., there is about the following ou cropping:

Outcropping in the N. W. ¼ of N. E. ¼ of S. 10, T. 20, R. 5 W.

(14)	Sandstone; ferruginous, visible from	5 to 6 ft. 0 in
(13)	Sanstone	1 ft. 0 in.
(12)	*Ore*	2 ft. 8 in.
(11)	Sandstone	5 in.
(10)	*Ore*	2 in.
(9)	Sandstone	2 in.
(8)	*Ore*	1 in.
(7)	Sandstone	1 and ½ in.
[6]	*Ore*	1 in.
[5]	*Sandstone*	1 and ½ in.
[4]	*Ore*	1 ft. 2 in.
[3]	*Sandstone; ferruginous*	5 in.
[2]	*Ore*	4 in.
[1]	*Sandstone; very ferruginous*	visible for 6 to 8 ft. 0 in.

The dip of this outcrop is about 35 deg. to the north-west. About 20 feet over it, there is an outcrop of another ore seam, the topmost of the three seams in the McAshan Mountain. This mountain ends in the western part of the S. E. ¼ of N. W. ¼ of S. 16, T. 20, R. 5 W., though its strata are continuous to the south-west to beyond the county line or for between 2 and 3 miles farther. At this south-west end of the mountain, there is an outcrop of a ledge about ten inches thick of very good ore. It is likely the bottom one of the three seams.

It is fossiliferous and pebbly. Its dip is about 20 deg. to the north-west.

The outcrops of this formation are continuous along the top and north-west side of the high mountain that bounds Massey's Cove, in the north-east part of the county, on the north-west, as far to the south-west as the N. E. ¼ of N. E. ¼ of S. 7, T. 16, R. 1 E., or to where the cove becomes narrow and broken. Here they strike up against a fault that has gradually crossed over the now narrow cove from its south-east to its north-west side. They are then to the south-west, to the very end of the cove, badly broken up and are for the most part engulfed in one or more faults.

On the south-east side of the cove, the rocks of this formation are continuous from the most south-west end or point of the cove to the north-east to the south-west corner of S. 4, T. 16, R. 1 E., where they become entirely engulfed in the fault that here gradually leaves the south-east side of the cove and crosses over to its north-west side. From here, on to the north-east, the rocks of this formation are entirely engulfed in the fault to beyond Stevens' Switch, when they begin to gradually come in again along the fault and are then continuous on up into St. Clair county.

The high mountain on the north-west side of the cove is the south east edge of the broad synclinal mountain that separates this cove from the Clayton Cove, the head of the Birmingham Valley. The waters of the Cahaba River or of Big Cahaba Creek keep on this broad mountain or run down its trough from near its north-east end to the south-west to its south-west end near Trussville. This broad synclinal trough of the mountain is for the most part covered with (g) Fort Payne Chert, though in places, along the creek or bottom of the trough and also on the south-east side of the trough, the rocks of this formation are washed down to or are laid bare. They are the surface rocks clear across the broad synclinal mountain near the county line or along the Springville road in S. 16, T. 15, R. 1 E.

On the south-east side of this broad trough, along a hollow in the N. E. ¼ of S. E. ¼ of S. 20, T. 15, R. 1 E., there are outcrops of two seams of ore. These seams are about 20 feet apart and are of excellent ore. The lower one, in an outcrop in the S. E. ¼ of S. E. ¼ of S. 20, T. 15, R. 1 E., is reported to be 3 feet thick, and, in an outcrop in the S. W. ¼ of S. E. ¼ of S. 20, T. 15, R. 1 E., it shows a thickness of about 22 inches. In this last outcrop, however, the upper part of the ore is shaly. The outcrop of the upper seam here, about 20 feet higher up in the strata, shows a thickness of only about 12 inches, though it is said to be 30 inches thick. Both of these seams are of very firm good ore, though the lower one has in it the large rounded grains or small pebbles. The dip here is about 10 deg. to the north-west. Average samples of the outcorps of these two seams, dried at 105 deg. C., gave the following analyses:

	(1)	(2)
Ferric Oxide	77.585	64.898
Silica	15.436	26.803
Phosphoric Acid	0.393	0.406

[1] Upper seam. A well leached ore with a few unusually large siliceous pebbles. Analyst, J. L. Beeson.

[2] Lower seam. A well leached ore with some rounded flattened siliceous grains. Analyst, J. L. Beeson.

Lower down the hollow, the strata are seen to be in waves with a north-east and south-west trend. To the south-west, along the Big Cahaba Creek in S. 31, T. 15,

R. 1 E., the rocks of this formation have not only been uncovered but have also been washed down into to a depth of over 100 feet. Along the creek here, there have been exposed two or more seams of ore, of which mention has already been made in giving the details of the south-east belt of these rocks in the Birmingham Valley.

On the south-east side of the mountain, some 40 feet from its top, there is in the road in the S. W. ¼ of N. E. ¼ of S. 32, T. 15, R. 1 E., an outcrop of ore that shows a thickness of about 6 inches. Higher up in the strata than this outcrop, on the north-west side of the mountain in the S. W. ¼ of S. W. ¼ of S. 32, T. 15, R. 1 E., there are outcrops of two seams of ore about 15 feet apart. In the outcrops of the lower of these seams, the ore is from 4 to 5 feet thick, though it is not good; and in the outcrops of the upper seam, the ore is much better or is good but is only about 14 inches thick. The dip here is from 25 deg. to 30 deg. to the WNW. The strata here bend towards the south as if they were about to curve around the south-west end of the cove but they do not go very far in this southerly direction before they are stopped, in the N. E. corner of S. 7, T. 16, R. 1 E., by the fault that has crossed over from the south-east side of the cove. They form next to the fault a high ridge and in the southern end of this ridge, near its top, there is an old test pit on the outcrop of a ledge of pebbly ore from 4 to 6 inches thick. Just over this ore, there is a few feet of yellowish shales and then some thick flaggy ferruginous sandstones of a yellow color. The dip here is from 10 deg. to 15 deg. to the WNW.

To the south-west, down in the point of the cove, as has already been stated, the rocks, on the north-west side of the cove especially, are very badly broken up. In the line of these broken up strata, there are two short ridges of the rocks of this formation. Near the south-west end of the longer and more south westerly of these two short ridges and on its north-west side in the N.W. ¼ of N.W. ¼ of S. 13, T. 16, R. 1 E., there is an outcrop of a seam of sandy ore that can be seen to a thickness of from 14 to 15 feet. It is covered by a hard sandy ledge about 18 inches thick. The dip here is about 30 deg. to the south-east. Along the road just to the south-west, this seam of sandy ore makes an outcrop with a visible thickness of from 10 to 12 feet. Its dip in the road is from 25 deg. to 30 deg. to the south-east. Higher up the road to the south-east, as it ascends the ridge, the dip gets steeper and steeper until, along the top of the ridge, it is from 50 deg. to 85 deg. to the south-east. Still farther along this road to the south-east, across a narrow valley, the head of the cove, there is, in the mountain on the south-east side of the cove, in the S. E. ¼ of N. W. ¼ of S. 18, T. 16, R. 1 E., the following outcropping:

Outcropping in the S. E. ¼ of N. W. ¼ of S. 18, T. 16, R. 1 E.

[6]	Debris; loose fossiliferous chert.	
[5]	Sandstones; massive, of a yellowish color, visible for about	10 ft. 0 in.
[4]	Sandstones; thin flags that weathers into shales, about	15 ft. 0 in.
[3]	*Ore;* the "Big Vein", about	32 ft. 0 in
[2]	Shales, Sandstones, Debris; from	25 to 30 ft. 0 in.
[1]	*Ore*, Shales; in alternate seams, the ore is a loose black ferruginous sand, visible for	3 to 4ft. 0 in.
[0]	Debris.	

The upper 38 inches of [3] the "Big Vein," is not so good as the rest of the seam. This 38 inches gets poorer and poorer or more and more sandy towards the top.

An average sample of the lower 30 feet of this outcropping, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	37.428
Silica	57.378
Phosphoric Acid	0.089

The dip of this outcrop is about 60 deg. to the south-east.

Some ¾ mile to the north-east, on the north-west side of the mountain to the south-east of the cove in the S. W. ¼ of S. E. ¼ of S. 7, T. 16, R. 1 E., there is the following outcropping:

Outcropping in the S. W. ¼ of S. E. ¼ of S. 7, T. 16, R. 1 E.

(14)	*Fossiliferous Chert*	
(13)	Debris; about	12 ft 0 in.
(12)	*Ore;* the "Big Vein", outcrop along the top of the ridge or mountain, about vertical, visible for over	30 ft. 0 in.
(11)	Shales; yellowish, at least	30 ft. 0 in.
(10)	Sandstone; ferruginous, of browish and blackish colors	thin.
(9)	*Ore*, Shale; the ore is of loose black ferruginous grains and carries the shale, yellowish and clayey on weathering, in streaks or thin partings, about	1 ft. 6 in.
(8)	*Ore;* granular, large grains	2 ft. 6 in.
(7)	Shales; yellowish, and argillaceous	3 in.
(6)	*Ore;* streak	1 in.
(5)	Shale; yellowish, from,	6 to 8 in.
(4)	Sandstone; of a dull yellowish gray color	6 in.
(3)	Shale; yellowish	2 in.
(2)	Sandstone; of a yellowish gray color	6 in.
(1)	Shales; of a yellowish color, visible about	1 ft 0 in.

The "Big Vein" (12) is siliceous and seems to get more and more so towards the bottom. The dip here is about 65 deg. to the south-east.

To the north-east, on the north-west side of the ridge or mountain, close to its top, in the S. E. ¼ of N. W. ¼ of S. 8, T. 15, R. 1 E., there is an outcrop of a seam of sandy ore that shows to a thickness of from 12 to 14 feet. It has in it streaks of clay, doubtless from weathered argillaceous shales, and a cover of flaggy sandstones and shales. The dip is about 70 deg. to the south-east.

In a short distance to the north-east, the rocks of this formation become engulfed in a fault for between 2 and 3 miles. Their next appearance is just to the north-east of Steven's Switch or Argo P. O., near the center of S. 34, T. 15, R. 1 E. From this outcrop, they are continuous on up into St. Clair County.

The Red Mountain (Clinton) Formation in the Cahaba Valley is almost wanting. On the north-west side of the valley, if present, it is engulfed in a fault, with the exception of in one place, and, on the south-east side of the valley, the formation is very poorly developed or is almost wanting. The single locality at which the rocks of this formation show on the north-west side of the valley is between two faults and is about one mile long from north-east to south-west. The accompanying Figure 8 is a section at this point.

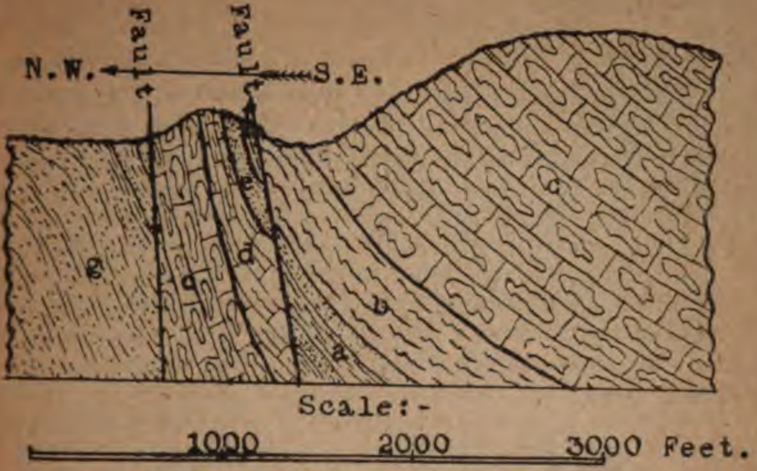


Fig. 8. Section south-west of Henryellen or in the S. E. ¼ of S. E. ¼ of S. 24, T. 17, R. 1 W.

(a) Montevallo (Variegated) Shales and Sandstones. (b) Coosa (Flatwood) Shales and Limestones. (c) Siliceous (Knox) Dolomite and Chert. (d) Pelham (Trenton) Limestones. (e) Red Mountain (Clinton). (f) Fort Payne Chert. (g) Coal Measures.

Near the north-east corner of this patch on the north-east side of a ravine, in the S. E. ¼ of S. E. ¼ of S. 24, T. 17, R. 1 W., there is the following outcropping:

Outcropping in the S. E. ¼ of S. E. ¼ of S. 24, T. 17, R. 1 W.

(6)	Loam, Debris.	
(5)	*Ore*	8 in.
(4)	Shale; with sandstone streak	18 in.
(3)	*Ore*; good	40 in.
(2)	Loam, Shale; a few inches.	
(1)	Sandstone; of a yellow color.	

This outcrop is bent over to the south-east until its dip is about 75 deg. to the north-west, while at the bottom of a test pit, only about 4 feet deep, the dip is some 85 deg. to the south-east. An average sample of this well leached ore of small rounded siliceous grains, dried at 110 deg. C., gave the following analysis:

Ferric Oxide	40.836
Silica	44.035

Phosphoric Acid.......... 0.707

Analyst, J. L. Beeson.

On the opposite or south-west side of the ravine, the outcrops are different. On this side of the ravine, there are outcrops of two seams of ore about 70 yards apart.

To the south-east of this locality, for a short distance on the opposite or south-east side of the Cahaba Valley, there is scattered over a low ridge some loose pieces of sandstones. These loose sandstones are the only rocks of this formation that have been seen on the south-east side of the Cahaba Valley in Jefferson county.

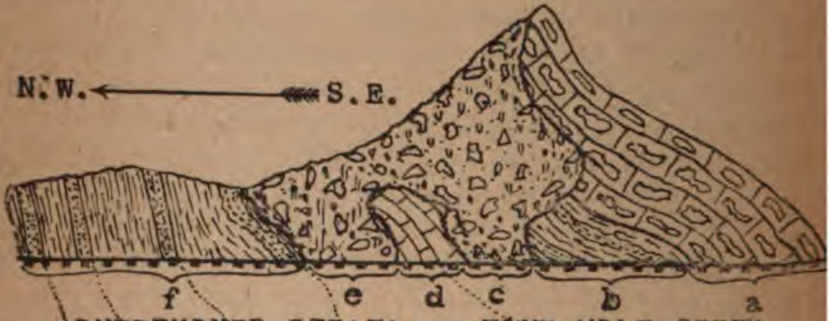
[4] *Devonian*, [f] *Black Shale*. This formation may occur along with all the belts of the underlying [e] Red Mountain [Clinton] Formation in Jefferson county, but it has been seen in only two places in the county and is known to be wanting in other places. If it was always present with the underlying strata, it would cover but little surface area. In one of the places in which it has been seen, the railroad cut through the Walker Gap to south-east of Birmingham, it is only 6 to 8 inches thick; in the other place, in Roup's Creek, the county line on the south-west, at Badoe's old tan yard to the north-west of Bucksville or in the northern part of the S. W. ¼ of S. 20, T. 20, R. 5 W., it shows to a thickness of 6 to 8 feet and may be much thicker.

(5) *Lower Sub-carboniferous*, (g) *Fort Payne Chert*. This formation, from 250 to 300 feet thick, covers some 30 square miles of the surface area of Jefferson county. It occurs, as narrow belts, in the Birmingham Valley in Massey's Cove, and in the Cahaba Valley, and as a broad belt over the synclinal mountain between the Massey and Clayton coves.

In the Birmingham Valley, it forms a narrow belt along the north-west and south-east edges of the valley, and, in the north-east and south-west parts of the county, one in the central part of the valley.

The belt along the north-west edge of the Birmingham Valley is especially narrow. It is not continuous through the county but has gaps in it in which its strata are engulfed in faults. Its strata are continuous from the county line on the north-east to the south-west to within about ¾ mile of Tarrant's Gap in the S. W. ¼ of S. E. ¼ of S. 29, T. 16, R. 2 W., with the exception perhaps of a short distance along Turkey Creek just to the north of Haygood X Roads. From Tarrant's Gap to the south-west to the Pratt Mines Railroad in the N. E. ¼ of S. 29, T. 17, R. 3 W., the gaps in its more or less broken up strata are short, but from this railroad to the south-west for nearly 15 miles its strata are engulfed in faults with the exception of a few short patches in which they are badly squeezed and broken up. Still farther to the south-west, on to beyond the county line, its strata are continuous. An inspection of the State Geological Map will show where its strata are engulfed in faults and where not. It is in good part of the upper or calcareous strata of the formation. Its strata, especially its lower ones, are often bent over towards the north-west until they have a south-east dip. They sometimes have a fault on each side of them.

The patches of this formation help to form a very broken, faulted, and irregular piece of country for several miles to the south-west of where the big fault that separates the Little and Big Basins of the Warrior Coal Field enters the Coal Measures, to the north-west of Bessemer. These patches or short ridges are separated from each other by not only faults but by also similar patches or short ridges of the (e) Red Mountain (Clinton) Formation. To the south-west of them about a mile, this formation, together with the (e) Red Mountain (Clinton), form a sharp narrow ridge in a broken faulted country of (h) Oxmoor Shales and Sandstones. This ridge is just about a mile long and stops just to the south-west of Valley Creek. Its south-west end is several hundred yards to north-west of the north-east end of the continuation of the belt to the south-west. The strata between these two ends or along Valley Creek are badly broken up. They are also broken up to the south-west for some ¾ mile or to the crossing of Five Mile Creek. The accompanying Figure 9, a sketch of the outcrop on the north-east side ofFive Mile Creek, shows how the strata are bent over towards the north-west on top of themselves until the bottom ones are on top.



OVERTURNED STRATA on FIVE MILE CREEK south-west of BESSEMER.

Horizontal and Vertical Scale:-
100 200 300 Feet.

(a) Fort Payne Chert. (b), (d), and (f) Oxmoor Shale and Sandstone.

{ (b) and (f) Shales and Flaggy Sandstones and (d) Limestones. }
{ (c) and (e) Debris. }

From Five Mile Creek to the south-west to beyond the county line, the strata of this formation are continuous and seemingly quite regular. They in places form a separate and distinct ridge from West Red Mountain. This separate ridge is of heavy bedded chert and is between two narrow valleys of cherty gray limestones that belong at the top and bottom of this formation.

The belt on the south-east side of the Birmingham Valley is continuous through the county from north-east to south-west. Its north-east end spreads out over the

d synclinal mountain between the Clayton and
sey coves. Its strata however in places on this
ntain,over the lowest part of the trough or along Big
iba Creek, are washed through or removed by de-
ition. At and near the north-east end of the moun-
they are removed entirely except in patches. The
r strata, of chert and cherty limestones, crop out in
y places along Big Cahaba Creek. The gravelly
in S. 36, T. 15, R. 1 W. is covered with the cherty
les of this formation. The upper strata of the
ation form to the north-west of Trussville a beauti-
ertile valley of red loam, about ¼ mile broad. The
r strata have over them on the south-east side of
Mountain in the N. E. ¼ of S. 28, T. 16, R. 1 W. a
iderable deposit of limonite. This ore is mostly
lar and some of it is cherty. An average sample
, dried at 100 deg. C., gave the following
ysis :

Ferric Oxide.............	75.823
Silica....................	15.023
Phosphoric Acid.........	1.219

is formation caps East Red Mountain along here in
s. It furnishes the gravel bed of Red Gap, shown
erfectly in Plate X. Its cherty gravels are especially
suited for macadamizing and are extensively used
his purpose.

cherty ledges of this formation show to a thickness of
70 feet in the Walker Gap in the N.W. ¼ of S.14,T.18,
W. and to a thickness of over 250 feet, near the full
ness of the formation,in the Sparks Gap in the north-
corner of S. 33, T. 19, R. 4 W. At and for some
le to the south-west of the Cow Gap in the S. E. ¼ of
T. 20, R. 4 W., this formatiom appears to form all

of East Red Mountain with the exception of its north-west base. Its rocks over most of the north-west side of the mountain here may be however loose rocks from the top of the mountain, for the north-west side of the mountain to the north-east and south-west is of the [e] Red Mountain [Clinton] Formation.

Some of the hard cherty strata near the bottom of the formation, along the top of the mountain in the N. W. ¼ of S. 7. T. 20, R. 4 W., are more or less ferruginous. The outcrops of this formation along Roup's Creek, the county line on the south-west, were estimated by the State Geologist, in his report for 1876, at from 275 to 280 feet thick. He describes these outcrops as heavy layers of cherty beds holding casts of crinoidal stem and brachiopod shells. The chert, he says, often resembles a porous friable sandstone from which calcareous matter has apparently been removed. He also says that in the chert there are at least three subordinate beds of limestones; one of them being a compact gray crystalline limestone, and an other a dark blue fine grain limestone.

The central belt of the valley in the north-east part of the county forms a loop around the south-west end of Blount Mountain. The strata of this loop are continuous with the exception perhaps of a short gap in the southern part of S. 12, T. 15, R. 1 W., where they do not show and so may be engulfed in a fault.

The central belt of the valley in the south-west part of the county is continuous and seemingly regular from the north-east end of the McAshan Mountain to the south-west to beyond the county line. It covers with its loose cherty nodules the sloping south-east side of this mountain. It is bounded on the north-west by a big underthrust fault that brings its strata in contact with the [c] Siliceous [Knox] Dolomite and Chert. Its outcrops of flinty cherty ledges along Roup's Creek, the county line on the south-west, are about 100 yards broad. They are so broken up as to have steep dips both to the north-west and to the south-east.

The belt on the south-east side of the Massey Cove is narrow and is completely engulfed in a fault for a couple of miles. At the north-east end of this gap in it, in a cut on the A. G. S. R. R. just north of Steven's Switch or Argo P. O. in the S. W. ¼ of S. W. ¼ of S. 34, T. 15, R. 1 E., there is an extensive potter's and brick clay bed. The strata here at this clay bed are badly broken up. The bed is between a ledge of massive sandstone of the [h] Oxmoor Shales and Sandstone on the south-east and of loose cherty nodules of the (c) Siliceous (Knox) Dolomite and Chert Formation on the north-west. The northern end of the cut is in the chert of this formation that are so badly broken up as to have no stratification. In the lower part seemingly of this chert, there is a seam from 5 to 6 inches thick that in places is a very good ore of maganese, pyrolusite, though it is usually nothing more than a manganese stained cherty seam. Next over this chert, there is a red or variegated clay that in places is a hard cherty clayey rock, about 20 feet thick, then the good clay that is mined. This clay however has sandy seams in it. It is of a dove color but would doubtless burn white. The strata just to the south-east of this clay bed are bent over towards the south-east until they have a dip of from 50 deg. to 80 deg. to the north-west.

From the south-west end of this gap, the strata are continuous to the south-west to beyond the point of the cove. The strata on the north-west side of the point of the cove, for a couple of miles from its south-west end, are badly broken up. To the north-east, they soon spread out over the broad synclinal mountain between the Massey and Clayton coves.

This formation on the north-west side of the Cahaba Valley is engulfed in a fault except in one place, but on the south.east side of the valley its belt is continuous across the south-east edge of the county. The single outcrop on the north-west side of the valley is of vertical and badly broken up strata between two faults. It is in contact on the south-east with Cambrian strata. It is shown in Figure 8. In the belt on the south-east side of the valley, in the N. W. ¼ of S. 11 and S. 14, T. 18, R. 1 W., there are some reported extensive deposits of limonite.

(6) *Upper Sub-carboniferous*, (h) *Oxmoor Shales and Sandstones*. This formation in Jefferson county, from 800 to 1200 feet thick, is principally of the (h) Oxmoor Shale and Sandstone type, though it carries some of the strata of the Bangor Limestones and Hartselle Sandstones. It makes about 135 square miles of the surface area of the county, occurring in irregular belts along the outer edges of the Birmingham and Cahaba valleys.

In the Birmingham Valley, it forms an irregular narrow belt along the north-west edge of the valley, a broad one along the south-east edge, and a narrow one in the central part of the valley in the north-east part of the county. It usually has in its lower strata some massive sandstones that nearly always form a ridge. Between this ridge and the Coal Measures, there is either a valley or a broken country of shales and thin bedded sandstones, with in places some patches of limestones. The shales and sandstones are sometimes calcareous and sometimes fossiliferous. The shales are usually black and bituminous and the sandstones are sometimes so.

The narrow belt along the north-west edge of the Birmingham Valley is engulfed in faults, more or less, in places. Its strata are often squeezed and broken up and pushed over towards the north-west until they have a south-east dip on the outcrop. This narrow belt however is continuous from the county line on the north-east to the south-west to the Pratt Mines Railroad in the N. E. ¼ of S. 29, T. 17, R. 3 W., with the exception of one short gap, though in other places some of its strata may be engulfed in faults. From this railroad to the south-west for some 10 miles, none of its strata have been seen, though they may occur in spots as do those of the underlying formation. Still farther to the south-west, they are continuous to the county line.

In this belt in the north-east part of the county, the massive sandstones near the bottom of the formation form a broken ridge that is known as the "*rockey row*." The strata of this formation over these massive sandstones at and near the county line are almost wholy of the limestones, the Bangor Limestones. Just over the county line, in Blount county, these limestones have been quarried extensively and used as a flux in the iron furnaces. They show to a thickness of about 150 feet and have a dip of 10 deg. to 15 deg. to the north-west. See Plate IX, Part I. To the south-west, they give place to the (h) Oxmoor Shales and Sandstones, occurring only in patches in these shales and sandstones.

Some of the lower strata of this formation are engulfed in a fault along Turkey Creek just north of Haygood X Roads. The sand pits north of North Birmingham appear to be in the outcrops of this formation, though the whole formation is completely engulfed in a fault just to the south-west, along the G. P. R. R. It however sets in again just to the south-west of this railroad and in about ½ mile to the south-west its massive sandstone has been quarried some. The rocks of this quarry are badly broken up and are bent over towards the north-west until they have a dip of from 30 deg. to 70 deg. to the south-east. These sandstones in a short distance to the south-west become engulfed in a fault, though the upper strata of the formation are probably continuous on to the Pratt Mines Railroad. Here the whole formation is engulfed and perhaps remains so for some 10 miles to the south-west. Its strata are next seen to the south-west of Bessemer where the big fault that separates the Big and Little basins of the Warrior Coal Field leaves the valley and enters the Coal Measures. They from here on to the south-west to Valley Creek form a very broken country, about ½ mile wide, that is badly faulted. Its strata for at least a part of this distance are duplicated. Its harder strata form ridges and its softer strata are washed out into narrow valleys and hollows. This broken faulted country has running up into it for nearly a mile from Valley Creek a ridge of underlying strata. It is in contact on the south-east, along a big fault, with the (c) Siliceous (Knox) Dolomite and Chert strata, which, in places, extend high up on its ridges. The most eastern of these ridges is, partly at least, of flaggy sandstones from 1 to 18 inches thick. These flagstones are calcareous though they have a flinty look. They are more or less ferruginous and hence their weathered surfaces have an iron rust appearance. Their weathered surfaces have also a glazy look and often open cracks in them. The black fissile shales of the valleys and hollows of this broken country also have in them more or less iron and hence they have been taken by prospectors for *black band ore*. They resemble the Devonian Black Shale. This broken faulted country has also some limestones with calcite streaks in them, as can be seen at its south-west end along Valley Creek.

The strata of this belt are broken up for perhaps a mile to the south-west of Valley Creek when they appear to become regular and to remain so to beyond the county limits on the south-west.

The belt on the south-east edge of the Birmingham Valley is continuous through the county from north-east to south-west. It is a broad belt, made so by a duplication, of a part at least, of its strata. This duplication is due to a strike fault near the center of the belt from north-east of Trussville to the south-west to the county boundary. This broad faulted portion of the belt corresponds to Shades Valley, which, south-east of Bessemer, has a maximum width of nearly five miles. The massive sandstones in its lower strata usually form a ridge along its north-west edge. This valley has also a ridge, in places at least, near its center or just south-east of the fault, of similar and probably identical strata with those of the other ridge.

Near Argo P. O. or Stevens' Switch, in the north-east part of the county, the massive sandstones near the bottom of the formation are broken up on the outcrop until they form a rough rocky row along the top of a ridge. They are here just to the south-east of a great underthrust fault and are bent over towards the south-east until they have a dip on the outcrop of from 50 deg. to 80 deg. to the north-west. The sandstones along the top of this ridge form near the center of S. 18, T. 16, R. 1 W., a vertical bluff that is almost impossible to climb from the south-east side, while on the north-west side there is but a gradual slope to its top from the broken country of the head or point of Massey's Cove. Shades Valley is here some 200 feet deeper than Massey's Cove.

These massive sandstones near the bottom of the formation are badly broken up in their bend around the head of Massey's Cove and up in the trough of the synclinal mountain between the Massey and Clayton coves. They are cut through near the point or head of the cove by the big underthrust fault that extends down from Springville by Argo P. O. into Massey's Cove and thence out into this belt and down its center (the center of Shades Valley) to the county boundary on the south-west. They are also engulfed in this fault for a short distance. They form a bluff along Big Cahaba River as it cuts through their extreme south-west end in the bend around the cove. In them on the east side of the river, there is a quarry from which stones were gotten for foundation work at the Trussville Furnaces.

These massive sandstones near the bottom of the formation, after making the bend in the trough of the synclinal mountain, are well exposed in many outcrops which show them to be of two thick ledges that are separated from each other by a few feet of softer strata and to be in flat unsymmetrical waves with a north-east and south-west trend. There is also exposed here in places under the lower ledge some calcareous shales about 15 feet thick to a gray limestone with cherty nodules that probably belongs at the top of the underlying formation. In the weathered outcrop of the lower ledge of sandstone in the S. E. ¼ of S. W. ¼ of S. 12, T. 16, R. 1 W., there is a sand pit, the rocks weathering into a beautiful white sand. These massive sandstones form to the north-west of Trussville a broad high ridge that is locally known as "*Sand Mountain*." The strata over them, principally calcareous shales with some interbedded limestones, form a beautiful low level and slightly rolling country around Trussville. In an outcropping of limestone on the south-east edge of this level and rolling country, on the A. G. S. R. R. in the S. W. ¼ of N. E. ¼ of S. 26, T. 16, R. 1 W., is the Worthington Quarry. This quarry is in light and bluish gray limestones that are quite pure as can be seen from the following analyses, taken from an article by C. A. Meissner, in the Proceedings of the Alabama Industrial and Scientific Society, Vol. IV, No. 1:

	(1)	(2)
Lime	50.03	48.19
Magnesia	2.01	2.30
Silica	2.16	3.12
Alumina and Iron Oxide	2.31	2.32

These limestones have been used extensively in the iron furnaces of the Birmingham district. Some of them carry lumps of concretionary balls of calcite.

In a high naked ledge of the massive sandstones near the bottom of the formation in the N. W. ¼ of S. E. ¼ of S. 28, T. 16, R. 1 W., there is a quarry from which the stones for the foundation work of the Thomas Furnaces are said to have been gotten; and in a limestone outcropping in the S. E. ¼ of S. W. ¼ of S. 33, T. 16, R. 1 W., there is an old quarry from which considerable rock has been taken for fluxing purposes. In the above massive sandstones, there is another quarry just to the northeast of Irondale. These sandstones in their outcrops in a cut of the branch railroad to the Sloss Limestone Quarry at Gate City are nothing more than a loose heap of sand. This sand is used for moulding purposes. Under this outcropping, there is about 15 feet in thickness of calcareous shales to the bottom of the formation.

The above massive sand-stones in their outcrop in Red Gap are badly broken up. They form the cuts seen on the G. P. and C. & W. railroads, Plate X. They, in their outcrops about ¼ mile to the south-west, furnished the sand for the Glass Works, built right at them, and are said to be 99% silica.

To the south-east of these sandstones about ¼ mile, in Shades Valley about in the S. E. ¼ of N. W. ¼ of S. 26, T. 17, R. 2 W., there are or were two large springs about 30 feet apart. Just to the south of them, 4 wells have been bored. Well No. 1 is about south of spring

No. 1, the more north-eastern spring, and some 75 feet south-east of spring No. 2. Well No. 2 is about 45 feet south-southeast of well No. 1. Well No. 3 is about 65 feet to the south-southwest of well No. 1, and well No. 4 is about 30 feet south of well No. 3. Wells Nos. 1 & 2 are 10 inches in diameter and wells Nos. 3 & 4 are 6 inches in diameter. The water rises to about the same level, the level of the springs, in all of these wells, though in wells 1 & 2 it does not come quite to the surface while in wells 3 & 4 it comes a little above the surface. This is because the former two wells are on higher ground. Basins with drainage channels, however, have been dug around both of the latter wells deep enough to permit of their overflowing. These wells are said to be respectively 103, 344, 25 & 85 feet deep. Wells 1 & 4 furnish the most water, seemingly about the same amount, and well 3 the least quantity. Well 4 is the only one that seems to vent a full discharge. Spring 1 has been almost dried up by the boring of these wells, while spring 2 does not seem to have been affected. This latter spring furnishes the water for the Glass Works, Sloss' Limestone Quarry, and Gate City.

In an outcropping of limestone in the low flat country of Shades Valley just to the south-east of the fault and to north-east of the L. & N. R. R., there is an old quarry. To the south-west of this railroad, there are several quarries in the massive sandstones near the bottom of the formation, forming a low ridge along the north-west edge of the valley. One of these quarries is opposite the Eureka Mines or in the S. W. ¼ of S. E. ¼ of S. 21 T. 18. R. 3 W.. and another one is opposite the Reiding Mines or in the N. E. ¼ of N. E. ¼ of S. 31. T. 18. R. 3 W. Their rocks are massive and in thick flags. They are coarse grained and of a light color They work well or split with equal ease in any direction and are durable building stone.

Limestone outcrops are said to occur along Shades Creek in the S. W. ¼ of S. 3, T. 20, R. 4 W. Shades Valley however is almost wholly of a sandy soil with a growth of short leaf pine. Some of its shales are argillaceous and so weather into a kind of joint clay. The black shales however must be porous, as water is usually found in them in digging wells. On a knoll or low ridge in the flat valley in the S. E. ¼ of N. E. ¼ of S. 5, T. 20, R. 4 W., there are outcrops of a yellowish flaggy sandstone that is used extensively for building chimneys, because it is of convenient thickness and can be easily cut with an old ax or saw.

Just to the north-west of the fault from the south-east corner of S. 13, T. 20, R. 5 W. to the south-west to the county line, there is a narrow belt of Coal Measures with the strata of this formation on each side of it. The bluff of conglomerates along the north-west edge of this belt crosses Roup's Creek or the county line at the Old Iron Works in the north–west corner of the S. W. ¼ of S. E. ¼ of S. 33, T. 29, R. 5 W. Up the creek from this conglomerate or from these old iron works, for about ¼ mile, are exposed the rocks of this formation. The State Geologist in his report for 1876 says that they are some 800 feet thick and that they are mostly of impure argillaceous and sandy limestones that weather into yellowish, brownish, and reddish arenaceous shales, often full of fossils. These limestones, he says, when fresh are exceedingly hard and tough, and ring like a metal under the hammer.

The central belt of this formation in the Jones or Birmingham Valley is in the form of a loop around the south-west end of Blount Mountain in the north-east part of the county. This loop is from ½ to 1 mile broad, except for a short distance to the south of the south-west end of Blount Mountain or in the southern part of S. 12, T. 15, R. 1 W., where its strata are seemingly for the most part engulfed in a fault. The upper strata of the formation however are continuous with the loop. To the south-west of the extreme south-west point of Blount Mountain or in the N. W. ¼ of S. W. ¼ of S. 12, and N. E. ¼ of S. E. ¼ of S. 11, T. 15, R. 1 W., and just to the north-west of the fault, there is a knoll of fossiliferous gray limestones. To the north of this knoll on the west slope of the point of Blount Mountain, there is exposed a great thickness of the limestones of this formation. In places these limestones are naked to a thickness of some 200 feet. Many of them are weathered into furrows and ridges, and some of them, especially in the lower strata, are very fossiliferous. Some of them carry a good deal of fossiliferous chert. These limestones and the massive sandstones near the bottom of the formation come together along the little creek that runs down the central part of the cove. The sandstones gradually rise from this creek towards the west to the top of a high broad ridge along the top of which they form a high bluff. This ridge or these sandstones suddenly stop on the south in a high bluff as they strike up against the fault in the north-west corner of the S. E. ¼ of S. 11, T. 15, R. 1 W. From this point they are continuous in a curve up into Murphree's Valley. They are very massive, and often friable on the weathered outcrops.

This formation in the Cahaba Valley forms a very broken piney woods country on the south-east edge of the valley. It does not occur at all on the north-west side of the valley, being engulfed in the great fault that bounds the Cahaba Coal Field on the south-east. Its broken country on the south-east side of the valley is from ½ to 1 mile broad, and is, so far as has been seen,

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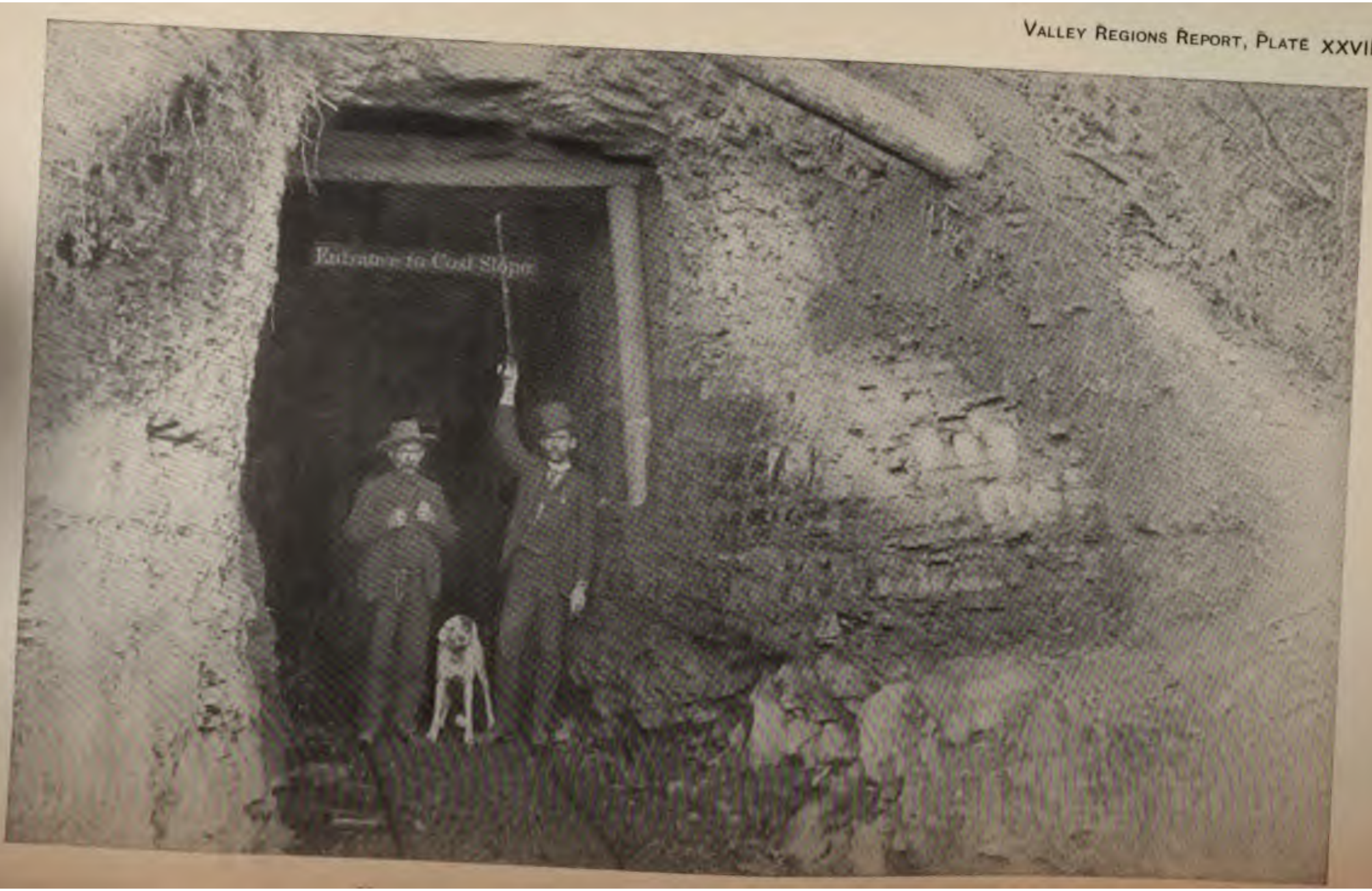
Entrance to Coal Slope

entirely of shales and sandstones. Its strata, in places at least, are broken up and in sharp unsymmetrical wrinkles with a north-east and south-west trend.

(7) *Carboniferous*, (i) *Coal Measures*. The Coal Measures, from 200 to 5000 feet thick, are the surface rocks of over 700 square miles or nearly 4-5 of the county. Of this area, the Warrior and Cahaba coal fields have respectively about 600 and 100 square miles, and the Coosa Coal Field not over a couple of square miles. The parts embraced in the Warrior and Cahaba coal fields are of the thickest and most productive parts of these fields, while those of the Coosa Field are of its lowest strata, the county line being along the north-western edge of that field. All of these measures have been and will be considered in special reports and so it is not necessary that much be said of them here.

Those of the Warrior Field have more of the available coal of that field than is to be found in any other county. They are over 4000 feet thick and have some 10 seams of coal that are each 2 feet 6 inches and over thick. Plate XII is a flash light view of one of the thickest of these seams at the head of a slope.

Those of the Cahaba Field, according to Mr. Squire's report, embrace the thickest and most productive portion of the Henry Ellen Basin. They are over 5,000 feet or nearly 1 mile thick and have some 12 coal seams that are each 2 feet 6 inches and over thick. Plate XXVII is a photographic view of one of the thickest of these seams on the outcrop.

Those of the Coosa Field are of the conglomerate and sub conglomerate rocks at the base of the measures. They can't be over a few hundred feet thick and, so far as known, have no coal of any importance.

This county furnished over 3-5 of the coal output of the State for 1895 and 1896, or 3,724,823 tons for 1895 and 3,724,719 tons for 1896. All of this output came from 4 seams in the Warrior Field, with the exception of 9,550 tons in 1895 from one seam in the Cahaba Field. The coke output for the county in 1895 was 1,355,876 tons, and in 1896 was 1,539,913 tons.

These coal Measures have also, besides their coal, good building and paving stones, and good plastic or potter's clay. They also in places in their lower strata have considerable iron ore, in regular stratified seams, that on the outcrop is limonite. The following analyses are of this limonite as it occurs on the Parson Mountain just to the north-east of Valley Creek:

Dried at 100 deg. C.	(1)	(2)	(3)
Ferric Oxide.............	78.109	72.974	85.411
Silica....................	5.620	12.974	1.982
Phosphoric Acid..........	1.225	0.267	0.295

(1) A brown concretionary ore with cavities and with streaks of compact ore of a dull iron color. The cavities carry much yellow ochre. Labled:—From under Millstone-grit, north-east of Bullard Shoals.

(2) A brown, sometimes a dark brown ore with a few small cavities and with streaks of yellow ochre. Labeled:—From outcrop of a seam between 2 and 3 feet thick, under Millstone-grit, north-east of Bullard's Shoals.

(3) A compact ore with a few small cavities and with some little yellow ochre over the surface. Labled:—About 600 feet over (2) and believed to be of a seam about 18 inches thick.

CHAPTER IX.

TUSCALOOSA COUNTY.

The gological formations exposed in this county are as follows:

[9] *Tertiary*	[j] *Lafayette*	
[8] *Cretaceous*	[i] *Tuscaloosa*	
[7] *Carboniferous*	[h] *Coal Measures*	4000–4500 feet
[6] *Upper Sub-carboniferous*	[g] *Oxmoor Shales and Sandstones*	800–1200 feet
[5] *Lower Sub-carboniferous*	[f] *Fort Payne Chert*	250– 300 feet
[4] *Devonian*	[e] *Black Shale*	0–10 feet
[3] *Upper Silurian*	[d] *Red Mountain [Clinton] Formation*	150–400 feet
[2] *Lower Silurian*	[c] *Pelham [Trenton] Limestones*	500– 600 feet
	[b] *Siliceous [Knox] Dolomite and Chert*	2000–2500 feet
[1] *Cambrain*	[a] *Coosa [Flatwood] Shales and Limestones*	400+ feet

(1) *Cambrian*, [a] *Coosa [Flatwood] Shales and Limestones.* This group, consisting entirely of the [a] Coosa [Flatwood] Shales and Limestones that are exposed to a thickness of 300 to 400 feet, covers less than 15 square miles of the surface area of Tuscaloosa county. It is of a belt from 1 to 2 miles broad that extends from Jefferson county to the south-west to about opposite or south-east of Vance, though Bibb county includes the greater width of this belt for 5 to 6 miles. This belt occupies the central portion of the Roup's Valley [the south-west end of the Birmingham Valley] and is the extension to the south-west of the south-east belt of this

formation in the Jones Valley, [the north-east end of the Birmingham Valley, in Jefferson county.] It is the upper strata of the formation, with a gentle south-east dip, except along its north-west edge where its strata have a steep dip and are badly contorted, broken up, and faulted. Plate XXVIII is of a photograph of these contorted strata. The upper strata with the general south-east dip, covering most of the width ot the belt, are however in broad flat unsymmetrical waves with a north-east and south-west trend. These waves however are not near so broad or deep as the unsymmetrical synclinal of the Cemetery Ridge or of the central part of the Jones Valley. These synclinals, like that synclinal, run a little more westward than the general trend of the valley.

The top strata of this belt are of hard blackish blue argillaceous limestones with thin interstratified flinty cherty seams that usually divide the rocks up into thin layers. These limestones are probably interstratified, in places at least, with seams of dark colored shales. They weather first into thin bedded shaly limestones, with often a dirty yellowish surface, that are separated by thin interstratified seams of flinty cherty shales, and then into clayey loams with the interstratified seams of flinty cherty shales in seams that are more or less broken up.

The outcrops of these rocks however most usually appear as scales or fragments of flinty, bone looking, wafer-like shales scattered over the surface and through clayey loam. These shaly scaly fragments are usually of a dirty yellowish color with a bluish interior and are hard and flinty enough to have a metallic ring. They are occasionally replaced by small fragments of chalky chert.

Under or in the lower part of the above shaly rocks, there is a limestone breccia that crops out in many places in this county. It is a hard rock, usually massive, with

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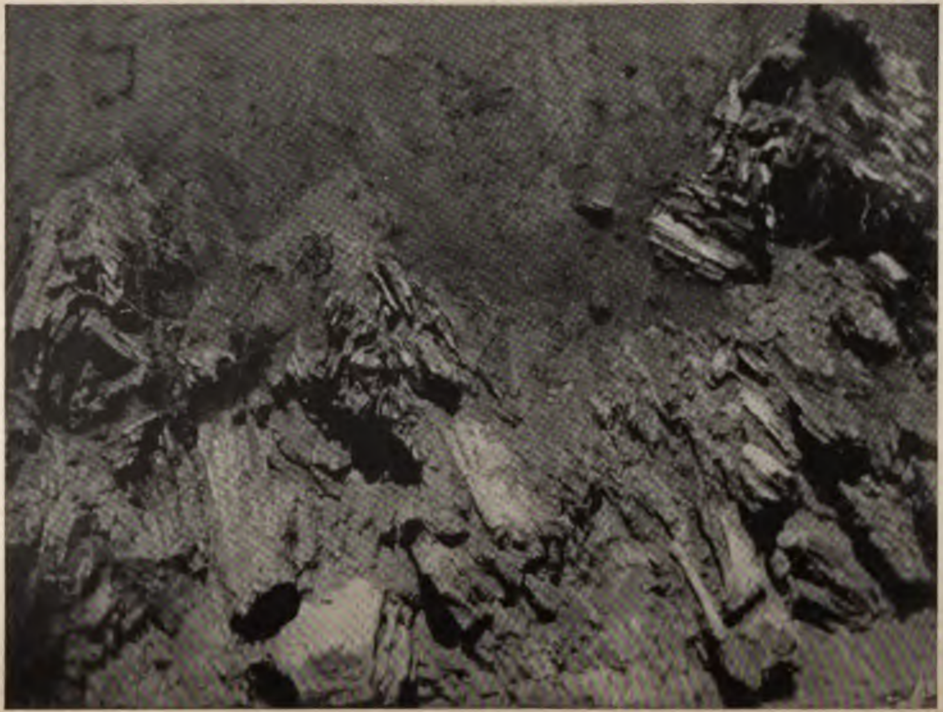

CONTORTED CAMBRIAN STRATA (COOSA SHALES), B. M. R. R.,
NEAR WOODSTOCK, ALABAMA.

irregular fragments of blackish blue limestones in a lighter colored silicueos calcareous matrix that on the weathered surfaces is rough or raspy. Its strata are separated by interstratified seams of shaly matter.

The above hard bony looking, wafer-like flinty shales have been seen in many places in red loam, near its south-east edge, that carries large beds of limonite and that covers the rocks of this formation over a strip of broken country in the central part of the valley in the north-east part of the county. Some of the loam and some of the ore may be from the destruction of the rocks of this formation but the most of it, with its iron ore, doubtless came from and now belongs to overlying formations. The effects of weathering on the hard blue limestones that underlie this red loam can be plainly seen in the railroad cut through the top of the divide in the N. W. ¼ of S. E. ¼ of S. 3, T. 21, R. 6 W. The lowest 6 to 8 feet of the embankment in the cut is of the undecomposed limestones in seams from ½ to 2 inches thick; the next 4 to 5 feet is of stratified yellowish shales with inter-stratified thin seams of dark loam, and then to the surface, 4 to 5 feet, is a reddish mulatto loam. The change from the limestones to the shales is very sudden, while that from the shales to the loam is gradual. The seams of shales are of the same thicknesses as the corresponding seams of the underlying limestones. They show more plainly that the stratification or that the limestones from which they were derived or the underlying limestones are badly crumpled up than do the limestones themselves. The covering loam has no evidence of stratification. The general dip of this exposure is some 50 deg. to the south-east. Plate XXVIII is of a photograph of a small portion of the side of this cut. At the north-east end of the cut, there are seams of yellowish clay with interstratified seams of blackish shales. These shales in their stratifications show most plainly that the limestones from which they were derived were badly crumpled up. These limestones would appear to be under those of the cut. Just over the limestones of the cut and with about the same dip. there is, at the south-east end of the cut, first a layer from 5 to 8 feet thick of sandy loam with limonite gravels, and then one from 6 to 8 feet thick with limonite boulders. This ore may have been derived from the underlying limestones, by the oxidation of their pyrites, but it is believed that its iron came from the [b] Siliceous [Knox] Dolomite and Chert strata and that the ore deposit belongs to the [8] Cretaceous, [i] Tuscaloosa Formation. This ore has been seen in other places hereabouts in stratified layers right on top of the Cambrian strata.

The strata of this formation are for the most part hid by a superficial covering of (8) Cretaceous and (9) Tertiary strata, still they make many fine exposures, especially along the creeks and branches. They gradually become covered up on the south west, as the valley gets geologically shallower, by the overlying (b) Siliceous (Knox) Dolomite and Chert.

(2) *Lower Silurian.* This group, from 2500 to 3000 feet thick, covers less than 25 square miles of the surface area of the county. It occurs on the north-west and south-east sides of Roup's Valley and is of the (c) *Pelham* (*Trenton*) *Limestones* and (b) *Siliceous* (*Knox*) *Dolomite and Chert.*

(b) *Siliceous* (*Knox*) *Dolomite and Chert.* This formation, from 2000 to 2500 feet thick, covers less than 15 square miles of the surface area of Tuscaloosa county. It, in a general way, is of a narrow belt along the north-west edge of the valley and of a much broader one along the south-east edge. It however includes the south-west end of the central belt of the Jones Valley or of the belt along the south-east edge of the McAshan Mountain synclinal. It is also believed to have given rise to most of the red loam and limonite of the broken belt of the central part of the valley in the north-east part of the county, though this loam and ore is now of the [8] Cretaceous and [9] Tertiary formations.

The belt along the north-west edge of the valley is of badly broken up and faulted strata, that are in many places bent over towards the north-west until they on the outcrop have a greater or less dip towards the south-east. It is of merely narrow patches with long gaps between in which its strata have been entirely engulfed in faults. The patches often have faults on each side of them. The location and extent of these patches can be best seen from an inspection of the geological map of the State. This north-west strip to the south-east of Vance's becomes united with the south-east strip, and so this formation to the south-east of Vance's and to the south-west spreads over the central part of the valley.

There however sets in near the mouth of the faulted unsymmetrical anticlinal cove to the north-west of Vance's, on the opposite or north-west side of a faulted synclinal from the above north-west strip, an other strip of the rocks of this formation that extends to the south-west to the south-east corner of T. 22. R. 8 W. Its rocks however are for the most part covered up by (8) Cretaceous and (9) Tertiary strata.

The north-west strip in the S. E. ¼ of S. 19, T. 20, R. 5 W., is between two faults and has over its surface considerable limonite. This ore occurs scattered over the surface also in the S. W. ¼ of S 25, T. 20, R. 6 W., and near the center of S. 3 and the N. E. ¼ of S. 9, T. 21, R. 6 W. In this strip in the S. W. ¼ of S. 9, and N. E. ¼ and S. W. ¼ of S. 17, T. 21, R. 6 W., there is seemingly a large deposit of limonite. It was years ago, in places, heaped up in piles to get it out of the way of the plough. Its outcrop on the south-west bank of Gallant Creek, as a bluff of large boulders, appears to be of a stratified layer with a dip of 30 deg. to 40 deg. to the south-east. Most of this ore is of good quality, thought some of it carries small rounded flint gravels and some of it has cherty pieces. It is in a red loam and is probably of the (8) Cretaceous, (i) Tuscaloosa formation, though it overlies this formation and its iron was doubtless derived from the rocks of this formation.

Good average sample of this ore, dried at 100 deg. C., gave the following analyses:

	(1)	(2)
Ferric Oxide..................	74.889	72.21
Silica........................	7.581	7.47
Phosphoric Acid..............	2.182	1.81

These analyses show the ore to be unusually high in phosphorus.

The strip that sets in near the mouth of the cove to the north-west of Vances has near its north-east end, or in the the S. E. ¼ of S. 32, T. 21, R. 7 W., considerable black limonite scattered over its surface. This ore is high in metallic iron, though it is mixed with a ferruginous breccia carrying cherty pieces and with loose chert. More limonite occurs over this strip farther to the south-west, around some large lime sinks in the N. W. ¼ of S. 17, T. 22, R. 7 W., and along the north-west edge of the strip in the N.W. ¼ of N. E. ¼ of S. 24, T. 22, R. 8 W. This last deposit has a great deal of good ore in it, though the good ore is mixed with some poor ore or ferruginous sandstone.

The south-east strip, so far as can be seen, is perfectly regular. It is, however, in Bibb county with the exception of its north-east end to the north-east of Greenspond, and a portion of it to the south-east of Vance's The portion to the south-east of Vance's is the spread out portion over the central part of the valley. It here becomes united with the north-west strip and its strata to the south-west are the lowest or oldest rocks exposed. It however soon becomes covered up to the south-west by (8) Cretaceous and (9) Tertiary strata. Its rocks over the central part of the valley are the lowest rocks of the formation. quite pure dolomites that lie tolerably flat and form a flat swampy country with a great many lime sinks over the low divide between the heat waters of Big Sandy Creek and those of Shultz and Hill creeks. These dolomites on their weathered surfaces have a dull yellowish appearance. They show in many of the lime sinks. They carry some oolitic chert with granules as large as mustard seed. There is also over them in places some little limonite.

Over the north-west edge of the formation, the south-west extension of the north-west strip, in the southern part of S. 9, T. 22, R. 7 W., there are, along with loose chert, many beautiful specimens of agate and chalcedony. Much of this chert has large cavities in it that are lined with quartz crystals. Some of these crystals are large and beautiful. To the north-east, in the Huntsville old road in the S. E. ¼ of S. 34, T. 21, R. 7 W., there is an outcrop of beautiful halloysite. Near the county line or along Hill's Creek as it cuts through a low ridge in the N. E. ¼ of S. 6, T. 22, R. 7 W., there is a great deal of concretionary chert.

Near the county line to the south-east of Greenpond or in the piney woods in the N. E. ¼ of S.W. ¼ of S. 12, T. 21, R. 6 W., at the north-east end of limonite deposits in Bibb county, there are several small test pits which have a fine showing of limonite though but little ore is to be seen over the surface. This ore is mostly porous and of good quality. It is said to occur also in the E. ½ of N. E. ¼ of S. 12, T. 21, R. 6 W. To the north-east, the lower rocks of this formation are in places covered with a growth of red cedar.

The central strip of this formation in the Jones' Valley or the strip along the south-east edge of the McAshan Mountain synclinal extends, as badly broken up and faulted strata, a mile or more down into this county. At or near their south-west end, there sets in, over the Cambian strata of the central part of the valley, a broken strip of red sandy loam that has long been noted for its large beds of limonite. The ore deposits and some at least of the loam of this strip are of the (8) Cretaceous, (i)Tuscaloosa Formation, though the materials of both the ore and loam were derived from the rocks of this formation. They overlie (a) Coosa (Flatwood) Shales and Limestones. The ore is most abundant near the north-east and south-west ends of the strip. A great many cuts have been made into these ore deposits near the north-east end or to the north-west and west of Tannehill. The ore is in boulders, nodules, and gravels. In places, it literally covered the surface and had to be heaped up into piles to enable the land to be cultivated. In places, it appears to be more or less stratified or to be in stratified layers. It is mostly porous and of good quality, though some of it is cherty and some of it has white chalky matter, disintegrated chert, filling its cavities. It carries some fine needle ore with fibres several inches long. The larger boulders are usually regular honey-

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[illegible]
[illegible]

COUNTY, ALABAMA.

comb ore or are full of small irregular cavities. They frequently have a slight ashy or grayish color and are not such good ore as the smaller boulders, nodules, and gravels. Some of the cuts are 40 or more feet deep.

This ore shows up especially well at *Goethite*, near the center of the S. E. ¼ of S. 30, T. 20, R. 5 W., where it is mined extensively by the Pioneer Mining and Manufacturing Company. It here however is better in some cuts than in others. In some of the cuts it extends to the surface while in others it has a covering of red loam, believed to be (9) Tertiary, (j) Lafayette formation, that is barren of all ore. At the time visited, there were 4 washers in operation at these mines. They are connected by a branch railroad with the Birmingham Mineral Railroad.

Plate XVI is of a photograph of the ridge with this magnificent deposit of ore and of the incipient mines, in 1887, at the beginning of work, and Plate XXIX is of a photograph of one of its banks in 1895. This last plate shows in the residual loam between the ore pockets a large boulder of contorted thin bedded limestone of the (a) Coosa (Flatwood) Shales and Limestones that underlie the ore deposit.

This ore is mined extensively also at the *Greely Banks* in the N. W. ¼ of S. 31, T. 20, R. 5 W., where it appears to be very extensive. The ore here too shows up better in some of the cuts than in others. In some of the cuts it appears to be in stratified layers. It however has usually a covering from 10 to 15 feet thick of red sandy loam without any ore. This sandy loam covering is believed to be (9) Tertiary, (j) Layfayette Formation. There were six double washers at these banks when last visited. They are on the branch railroad to Goethite. Stock-house samples at the Bessemer

VALLEY REGIONS REPORT, PLATE XXIX.

[illegible] of these banks gave, according t[illegible] [illegible] the following analysis:

[illegible]	43.08%
[illegible]	0.45%
[illegible]	21.04%
[illegible] Water	1.30%
[illegible] Water	11.30%

[illegible] been extensively mined at the *Eureka* [illegible] and the *Williamson Banks* in the [illegible] S. 1, T. 21, R. 6 W. These banks [illegible] by a branch railroad with the A. G. S. [illegible] many other old cuts in this neighbor- [illegible] must have yeilded large quantities

[illegible] Greely, Eureka, Willimson, etc., banks [illegible] one and the same deposit of ore.

[illegible] *Banks* are on the county line and [illegible] Railroad some 3 miles south-west [illegible] cover considerable surface area, though [illegible] are in the S. E. ¼ of S. E. ¼ of S. 10, [illegible] The deposit of ore seems to be a large [illegible] of it is rough ore or is merely a ferrugin- [illegible] conglmerate. The ore is in boulders, [illegible] though principally in large boulders. [illegible] concretionary ore with the cavities filled a [illegible] loam or a snuff colored ochre. The [illegible] therefore for the most part a honey-comb ore. [illegible] ferruginous sandstone and conglomer- [illegible] occurs on top or as a covering to the good [illegible] sometimes occurs along with the good ore, [illegible] patches or pockets. It too is for the most [illegible] with its thin shell carrying glistening crystals of silica and specks of mica. This *rough ore* is sometimes argillaceous and of a red liver color with the appearance of *turgite*. It sometimes becomes scaly on the weathered surfaces. The ore of these banks, in places at least, appears to be in a stratified layer with a general dip of some 8 deg. to 10 deg. to the south-east, that is in waves and wrinkles with a north-east and south-west trend. The ore however is more or less in pockets within the layer. It is much more in pockets than is the covering ferruginous sandstone or conglomerate. This ore deposit seems to butt up against bedded Cambrain limestones on the south-east. It may be in an unsymmetrical synclinal with the steep strata along the south-east edge. The following is an approximate section of the outcropping here at these banks:

Section at the Edward's Limonite Banks.

(4) *Deep Red Loam* (*Lafayette*); with small well rounded flint pebbles in irregular streaks and scatered through the loam, the surface loam, about	10 ft.
(3) *Hard Pan;* an irregular crust or seam of micaceous ferruginous sandstone or conglomerate; the pebbles of the conglomerate are small and rounded and of both flint and chert. From .	0 to 1 ft 6 in.
(2) *Reddish Sandy Loam*; with some pyrolusite and manganiferous limonite as a soft smutty powder in irregular pockets and as hard crusts, the loam is not so red as the surface loam From	0 to 4 ft.
(1) *Limonite:* in a matrix of usually very sandy micaceous loam or micaceous sand with patches of irregular streaks of the stiff plastic laminated gray clay (Tuscaloosa) and with some rounded flint pebbles and some small badly weathered angular chert peb-	

bles; the gray laminated clays however frequently form the whole of the matrix. Seen to a thickness of about .... 40 ft.

In the railroad cut through the western edge of these banks, the sandy loam (2) of the above section has in i patches of the stiff laminated (Tuscaloosa) gray clays The ore here is in a stratified layer from 12 to 15 fee thick of very sandy loam, that lies right on top of Cam- brian limestones. This layer has the general dip, about 50 deg. to the south-east, of the underlying lime- stones.

A fair average sample of the good ore exposed in the Edward's Bank, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	64.993
Silica	15.449
Phosphoric Acid	2.450

The above analysis shows the ore of these banks to be very high in phosphorus. Some bold springs of fine chalybeate water run from out of these ore banks.

On the eastern edge of this ore deposit and on much higher ground than the ore of the cuts, there is a different kind of limonite. It is a harder and more compact ore and has a higher percentage of iron, though some of it has cherty spots. It is in the surface red loam to a depth of seemingly some 30 feet and appears to be in large quantity.

(c) *Pelham (Trenton) Limestones.* This formation, from 500 to 600 feet thick, does not cover over 6 to 8 square miles of the surface area of the county. It is of a strip along the north-west edge and one along the south-east edge of the valley. The one along the north-west edge of the valley, to the north-east of Vance's, is only in patches, being for the most part engulfed in faults. To the south-west of Vance's, it is doubtless continuous, though it is almost wholly covered up by overlying unconformable (8) Cretaceous and (9) Tertiary strata and is partly in Bibb county. Its limestones in the S. E. ¼ of N. W. ¼ of S. 17, T. 21, R. 6 W., have been piled up into heaps and burnt into lime. In their outcrop in the railroad cut just to the east of Vance's, they are badly broken up and would be taken for Cambrian strata did they not carry the Trenton fossils. They are here impure bluish limestones, mostly thin bedded, with a great deal of calcite in streaks and splotches. To the south-west, on the county line or in the south-east corner of S. 9, the north-east corner of S. 16, and the north-west corner of S. 17, T. 22, R. 7 W., these limestones make an exposure of 25 to 30 acres in extent, forming a cedar glade that is known as the *lime-cliffs* or *lime-kilns*. In this glade, there are a dozen or more old "*lime clamps*" or *lime-kilns*, or places at which these limestones were heaped up into piles and burnt into lime. They are said to make the best of lime.

An isolated patch of exposed Pelham (Trenton) Limestones, principally in Bibb County, extending westward across the county line into the eastern edge of S. 1, T. 24, R. 7 W., is doubtless of this north-west strip. In S. 2, T. 24, R. 7 W., there is another isolated patch of exposed Pelham (Trenton) Limestones. It might be of this north-west strip after it had bent around the south-west end of the synclinal to the northwest of it. The strata however hereabouts are so broken up and covered up as to make it impossible to tell much about the structure.

To the north-west of this north-west strip at its south-west end or in the south-west and south-east corners of respectively R's 7 & 8, T. 22 S., or around the south-west end of the anticlinal to the north-west of the above north-west strip, there is another strip of Pelham (Trenton) Limestones that extend for a couple of miles up on each side of the anticlinal before becoming covered up and engulfed in faults. The limestones of this strip are finely exposed around the south-west end of the anticlinal or along Big Sandy Creek in S. 24 T. 22, R. 8 W.

The south-east strip of the Roup's Valley is continuous and seemingly perfectly regular so far as it can be seen. Only its north-east end for about 4 miles, however, is within this county. Its outcrops can be seen along the prongs of Roup's Creek.

(3) *Upper Silurian,* [d] *Red Mountain* (*Clinton*) *Formation.* This formation, from 150 to 400 feet thick, does not form over 6 square miles of the surface area of the county. It is of a strip along the north-west edge and one along the north-east edge of the Roup's Valley, and of the central strip of the Jones Valley or the McAshan Mountain strip that extends something over a mile down into this county.

The strip along the north-west edge of the valley is of badly broken up and faulted strata. It is however continuous to within less than 4 miles of Vance's, then on to below Vance's it is merely in patches that can be best seen from an inspection of the State Geological Map. To the south-west of Vance's, it is of a narrow synclinal and is badly broken up.

In this strip near the county line on the north-east, there are three seams of ore about as in the following outcropping:

Outcropping in the N. W. ¼ of N. E. ¼ of S. 19, T. 20, R. 5 W.

(13)	Shale; yellowish.	
(12)	*Ore*; good, soft or well leached	3 ft. 1 in.
(11)	Clay; about	9 in.
(10)	*Ore*; good	1 ft. 6 in.
(9)	Debris; about	30 ft. 0 in.
(8)	*Ore*; good, seemingly about	7 in.
(7)	Debris, Sandstones	30 ft. 0 in.
(6)	Clayey Loam: red, about	6 in.
(5)	*Ore*; ledge	1 ft. 4 in.
(4)	*Ore*, Shale; the ore is shaly	8 in.
(3)	Shale, Loam; the shale is yellowish and the loam is reddish	8 ft. 0 in.
(2)	*Ore*; ledge	1 ft. 7 in.
(1)	Debris.	

This north-west strip in places forms a separate and distinct ridge all to itself. Where cut through by the Birmingham Mineral Railroad in the N. E. ¼ of S. 3, T. 21, R. 6 W., there occurs about the following section:

Section on Birmingham Mineral Railroad in N. E. 1-4 of S. 3, T. 21, R. 6 W.

[18]	Debris; Fort Payne Chert, most likely covers *Devonian*.	
[17]	Debris; Red Mountain (Clinton) Formation, along the railroad for about	175 ft.
[16]	*Limonite*; stratified layer, with yellowish ochre between nodules, dip 75 deg. to 80 deg. to the south-east, from	6 to 8 ft.
[15]	Loam; a yellowish ochreous color, doubtless from Clinton Shales	7 ft.
[14]	*Red Ore*; sandy, pinkish brown color	12 ft.
[13]	*Red Ore*, Loam; the ore is sandy, about	12 ft.
[12]	*Red Ore*; like (14)	3 ft.
[11]	Shale; yellowish and orange colors, about	60 ft.
[10]	*Red Ore*: soft, with very small rounded pebbles or large siliceous grains, about	1 ft. 5 in.
[9]	Shale; a bright yellowish color	5 to 6 ft.
[8]	*Red Ore*; sandy and soft or well leached, about	22 ft.
[7]	Sandstone; yellowish ochreous color, about	4 ft
[6]	*Red Ore*; very good, pinkish, about vertical on outcrop	1 ft. 2 in.

[5] Sandstone; flaggy, yellowish ochreous color, soft .... 9 to 10 ft.
[4] *Red Ore*; not very good, about .... 0 ft. 5 in.
[3] Sandstone; like (5), visible for about .... 25 ft.
[2] Debris; Red Mountain (Clinton) formation, though it may cover some *Pelham* (*Trenton*) strata, on north-west side of narrow depression.
[1] Debris; *Pelham* (*Trenton*) *Limestones*..

The limonite (16) of the above section appears to be between strata of this formation or to be of this formation. It is very high in phosphorus. Average samples of it and of the red ores (10) and (6), dried at 100 deg. C., gave respectively the following analysis:

	[1]	[2]	[3]
Ferric Oxide	66.068	53.097	72.123
Silica	16.562	27.163	19.950
Phosphoric Acid	2.745	0.165	0.251

(1) A common limonite with much yellow ochre over its surface.
(2) A *soft* or leached red ore with no lumps.
(3) A *soft* or leached red ore with no lumps.

Analyst:—J. L. Beeson.

To the south-west of the above outcropping some 75 yards, or just across a ravine, there is a test pit with the following section:

[7] Debris; loam with fragments of flaggy sandstones about 2 inches thick, of a yellowish ochre color. .... 5 ft.
[6] *Red Ore*; with clayey streaks .... 1 ft.
[5] Sandstone; ferruginous, of an orange color, visible .... 6 ft.
[4] Debris: about ....
[3] Sandstone; in thick flags, of an orange color, a few feet thick .... 5 to 6 ft.
[2] *Red Ore*; very sandy ....
[1] Sandstone.

The ore (2) is said to be squeezed out down to only about 1 foot in a short distance down on the dip, which is about 75 deg. to the north-west.

To the south-west about ¾ mile, there are some old test pits with the following outcropping:

[16]	Loam.	
[15]	*Red Ore;*	3 in.
[14]	Clay; streak	½ in.
[13]	*Red Ore;* with clay streaks in places	6 in.
[12]	Clay	1 in.
[11]	*Red Ore*	1 ft. 2 in.
[10]	Loam	2 in.
[6]	Clay; merely a streak.	
[8]	*Red Ore*; about	3 in.
[7]	Clay; merely a streak.	
[6]	*Red Ore*	8 in.
[5]	Debris; about	20 ft. 0 in.
[4]	*Red Ore.* Shale; principally good ore	1 ft. 2 in.
[3]	Shale, *Red Ore;* principally shale	2 ft. 9 in.
[2]	*Red Ore*; with a little shale	1 ft. 4 in.
[1]	Shale; yellowish, visible to a thickness of	10 to 12 ft.

This outcropping shows two different seams of ore, The lower seam, from (2) to (4) inclusive, has shale partings, and the upper seam, from (6) to (15) inclusive, has clay partings. An average sample of the ore of the upper seam, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	40.212
Silica	38.988
Phosphoric Acid	1.817

Analyst:—J. L. Beeson.

To the south-west of this last outcropping, there is scattered over the surface some red ore with the small rounded siliceous pebbles. The red ore ridge however soon becomes so covered up by the Creataceous and Tertiary strata for about ½ mile as to be hard to follow. Just to the south-west of Gallant's Creek, this ridge is very broad, and, in the N. W. ¼ of S. W. ¼ of S. T. 21, R. 6 W., it is split by a narrow hollow. On ridge to the south-east of this hollow, there are sev deep test pits. In one of these pits, there is the foll ing section :

Section in N. W. ¼ of S. W. ¼ of S. 9, T. 21, R. 6 W.

[11]	Shale; yellowish	
[10]	*Red Ore;* very sandy ore with streaks of yellowish shale, the ore is of a brown color and has in its upper part the rounded siliceous pebbles	15 ft.
[9]	Loam; deep red, may cover *Ore*, about	4 ft.
[8]	Shale; grayish	12 to 14 ft.
[7]	*Red Ore;* very sandy, of very irregular thickness	2 in. to 1 ft.
[6]	Shale; yellowish, very irregular in thickness	4 in. to 1 ft.
[5]	*Red Ore;* a very sandy dark brown ore with some streaks of good ore and some of shale, about	6 ft.
[4]	Shale; yellowish	1 ft. 6 in. to 2 ft.
[3]	*Red Ore*; very sandy ore of a brown color	0 ft. 5 in.
[2]	*Red Ore*, Loam; the ore is good and has an unctuous feeling, about	0 ft. 5 in.
[1]	Shale, Loam; the shale is yellowish and the loam is deep red, about	15 ft.

To the north-west, on the opposite side of the hol there is, in the N. E. ¼ of S. E. ¼ of S. 8, T. 21, R. 6 a deep pit with the following section :

Section in N. E. ¼ of S. E. ¼ of S. 8, T. 21, R. 6 W.

[10]	Loam; deep red.	
[9]	*Red Ore;* a fine glistening unctuous ore, in very thin irregular streaks in other strata with a thickness of	5 in
[8]	*Red Ore*; a dark ferruginous sandstone	10 to 12 ft. 0 in.

[7] Shale, *Red Ore*; in alternate streaks, about ....9 in.
[6] *Red Ore*; like (8)......... .... 4 ft. 0 in.
[5] Sandstone; yellowish, about... ....11 in.
[4] *Red Ore*; like (8) ....6 to 8 ft. 0 in.
[3] Shale; thin.
[2] *Red Ore*; very sandy, of no value.........8 to 10 ft
[1] Sandstone; yellowish

The strata of this formation here at these last two sections are just to the north-west of a fault and are doubtless badly broken up, as indicated by the dip.

To the south-west, in a deep pit in the S. E. ¼ of S. E. ¼ of S. 8, T. 21, R. 6 W., there is the following section:

Section in S. E. ¼ of S. E. ¼ of S. 8, T. 21, R. 8 W.

[5] Shale; yellowish.
[4] *Red Ore*; very sandy, no value ....10 to 12 ft.
[3] Shale, *Red Ore*; in alternate streaks 9 to 10 ft.
[2] *Red Ore*; very sandy, no value ....8 to 9 ft.
[1] Shale, *Red Ore*; in alternate streaks, visible to a thickness of .... 1 ft. 6 in.

In the yellowish shales just over the very sandy red ore or ferruginous sandstone in the S. W. ¼ of S. E. ¼ of S. 8, T. 21, R. 6 W., there are thin seams of very hard ore that has a metallic ring when struck with the hammer.

The strata of this formation are engulfed in a fault from the western part of S. 17, T. 21, R. 6 W., to the N. W. ¼ of N. E. ¼ of S. 25, T. 21, R. 7 W., where several deep test pits have been sunk into them. The ore of these pits is of good quality, it is soft and unctuous, but it has streaks and splotches of clay all through it and there is a great deal of clay both over and under it. In the most north-western of these pits, the ore, from 2 feet to 2 feet 6 inches thick, has not only clay streaks through it but also, near its center, a parting of shale from 4 to 6 inches thick. In an other test pit some 10 to 15 yards to the south-east, the ore with its numerous clay streaks and splotches is 5 to 6 feet thick. The ore of this pit on being exposed to the weather crumbles. The strata hereabouts are badly broken up. They have faults on each side of them and are bent over towards the north-west until they have a south-east dip.

The next appearance of the rocks of this formation to the south-west is at Vance's, where there are seemingly the outcrops of two seams of ore. One of these seams runs about under the depot and the other is 75 to 100 yards to the north-west. This latter or upper seam is said to carry here over 17 feet in thickness of ore. Its ore however is split up by clay streaks and seams. This outcrop is in or near badly broken up and faulted strata. The ore is a *soft* or well leached ore of very fine quality. The following is given as an analysis of this ore by the N. Y. Metallurgical Works, E. N. Riotte, Manager:

Metallic Iron.......62.59%—Iron Oxide 89.42%
Silica............... 9.88
Sulphur........... .. 0.01
Phosphorus .... 0.231—Phosphoric Acid. 0.54%

The ore outcrop along here is badly covered up by residual matter, though it makes an other showing several hundred yards to the west.

The strip to the south-west of Vance's is a narrow synclinal on down into Bibb county. It gradually peters out towards the south-west. The central part or trough of this synclinal is in places covered by a narrow strip of [f] Fort Payne Chert. The chert to the south of the railroad or in the S. W. ¼ of S. 35, T. 21, R. 7 W., has been removed for a short distance from over the synclinal and the strata of this formation are the rocks clear across the synclinal. There is here in the upper strata of this formation a very massive conglomerate that is a mere mass of small angular flint pebbles with smooth or rounded corners. These bluffy sandstones where cut through by a small creek in the western part of S. 34, T. 21, R. 7 W., are about 50 feet thick. The strata of this formation on the north-west side of the anticlinal are well exposed along the A. G. S. R. R. in the N. W. ¼ of S. 34, T. 21, R. 7 W., where they are in wrinkles with a north-east and south-west trend. They extend for a short distance to the north-east up into the anticlinal cove with a central fault. Along their north-west edge just north of the railroad, there are outcrops of a seam of ore, which appears to be about 8 feet thick in an old test pit near the center of the N. E. ¼ of S. 33, T. 21, R. 7 W. The strata just to the north-west of this pit are very badly broken up, as can be seen in the railroad cut. The strip here is bounded on the north-west by a fault. To the north-west of the fault, there are first Sub-carboniferous strata and then a narrow streak of this formation that is in contact on the north-west with [b] Siliceous [Knox] Domite and Chert strata, with of course a fault between. The strata hereabouts are very badly broken up and faulted.

To the south-west, near the center of the S. E. ¼ of S. 33, T. 21, R. 7 W., in the strata on the north-west side of the synclinal, there is an outcrop of very good soft or well leached ore with flattened rounded oolitic siliceous grains or small pebbles. This ore, in thin hard seams, is interstratified with thin clayey or argillaceous shaly seams On the opposite or south-east side of the synclinal, in the N. W. ¼ of S. E. ¼ of S. 34,

T. 21, R. 7 W., in the edge of a low flat country, there are several shallow test pits in which good ore was found. Nothing, however, could be told as to the thickness of this ore. It shows in places over the surface for over ¼ mile to the north.

The rocks of the synclinal show for a short distance to the south of the old Huntsville road or to the S. W. ¼ of S. W. ¼ of S. 4, T. 22, R. 7 W., and are then hid by the overlying unconformable Cretaceous and Tertiary strata on down to the S. W. ¼ of N. E. ¼ of S. 17, T. 22, R. 7 W. They show an outcropping of ore near the county line or in the N. W. ¼ of N. W. ¼ of S. 20, T. 22, R. 7 W. This strip after passing through a corner of Bibb county, doubtless makes, as it bends around the south-west end of the anticlinal to the north-west, the patch of Red Mountain [Clinton] strata that shows in the northern part of S. 1, T. 24 N., R. 7 E. On the north-west side of the anticlinal in the N. E. ¼ of S. 13, T. 22, R. 8 W., there is an other short ridge of this formation just to the south-east of a fault.

Two other short ridges of this formation are to be seen principally in S. 2, T. 24 N., R. 7 W. They are separated by a narrow valley of [illegible] Pelham (Trenton) Limestones with a fault along its north-western edge. The other strata have been [illegible] up by the unconformable Cretaceous and Tertiary formations as to make it [illegible] their structure. [illegible] these two ridges. [illegible] S. 2, T. 24 N., R. 7 W. [illegible] ore. This [illegible] strata of [illegible] the north-west [illegible] seen.

[illegible] Roup's or

Birmingham Valley does not cover much area in Tuscaloosa county. It is wholly within this county for only about 1 mile or between the prongs of Roup's Creek. To the south-west for nearly three miles, it is partly or mostly within this county, the line between this county and Bibb county being along the top of its ridge or mountain (East Red Mountain). It has two seams of red ore, the upper of which is about 3 feet thick.

The central or McAshan Mountain strip is continuous for about a mile down into this county. This strip along the county line, a branch of Roup's Creek, has at its top about 150 feet of impure limestones with some interstratified thin ledges of hard ferruginous and sometimes porous sandstones. Some of the limestones are shaly and some of them are full of calcite streaks. Over its surface, the steep south-east side of a ridge, in the S. W. ¼ of S. W. ¼ of S. 20, T. 20, R. 5 W., there is a great deal of loose red ore of good quality. This strip at and near its south-west end is between two faults and is of badly broken up strata that have been pushed over towards the north-west until they have a south-east dip on the outcrop.

(4) *Devonian* (e) *Black Shale.* This formation may occur as a narrow streak wherever the underlying [d] Red Mountain [Clinton] Formation and the underlying [f] Fort Payne Chert are to be found, though it has been seen in only two places, or one place for certain, in Tuscaloosa county. It is believed to be almost, if not entirely wanting in many places where it ought to be. It shows a thickness of 6 to 8 feet where the McAshan Mountain strip crosses the creek or county line about ¼ mile north-west of old Bucksville. It may be thicker here as debris occurs just to the south-east of this outcropping for some 25 feet to a hard thin ledge of a fine grain ferrugi-

T. 21, R. 7 W., in the edge of a low flat country, there are several shallow test pits in which good ore was found. Nothing, however, could be told as to the thickness of this ore. It shows in places over the surface for over ¼ mile to the north.

The rocks of the synclinal show for a short distance to the south of the old Huntsville road or to the S. W. ¼ of S. W. ¼ of S. 4, T. 22, R. 7 W., and are then hid by the overlying unconformable Cretaceous and Tertiary strata on down to the S. W. ¼ of N. E. ¼ of S. 17, T. 22, R. 7 W. They show an outcropping of ore near the county line or in the N. W. ¼ of N. W. ¼ of S. 20. T. 22, R. 7 W. This strip after passing through a corner of Bibb county, doubtless makes, as it bends around the south-west end of the anticlinal to the north-west, the patch of Red Mountain [Clinton] strata that shows in the northern part of S. 1, T. 24 N., R. 7 E. On the north-west side of the anticlinal in the N. E. ¼ of S. 13, T. 22. R. 8 W., there is an other short ridge of this formation just to the south-east of a fault.

Two other short ridges of this formation are to be seen principally in S. 2, T. 24 N., R. 7 W. They are separated by a narrow valley of (c) Pelham (Trenton) Limestones with a fault along its north-west edge. The older strata here however are so covered up by the unconformable Cretaceous and Tertiary formations as to make it impossible to tell much about their structure. In the lower strata of the south-east of these two ridges. there is in the western part of the S. E. ¼ of S. 2, T. 24 N., R. 7 W., an outcropping of sandy red ore. This is the most south-western point at which the strata of the (d) Red Mountain (Clinton) Formation on the north-west side of Roup's or Birmingham Valley can be seen.

This formation on the south-east side of the Roup's or

Birmingham Valley does not cover much area in Tuscaloosa county. It is wholly within this county for only about 1 mile or between the prongs of Roup's Creek. To the south-west for nearly three miles, it is partly or mostly within this county, the line between this county and Bibb county being along the top of its ridge or mountain (East Red Mountain). It has two seams of red ore, the upper of which is about 3 feet thick.

The central or McAshan Mountain strip is continuous for about a mile down into this county. This strip along the county line, a branch of Roup's Creek, has at its top about 150 feet of impure limestones with some interstratified thin ledges of hard ferruginous and sometimes porous sandstones. Some of the limestones are shaly and some of them are full of calcite streaks. Over its surface, the steep south-east side of a ridge, in the S. W. ¼ of S. W. ¼ of S. 20, T. 20, R. 5 W., there is a great deal of loose red ore of good quality. This strip at and near its south-west end is between two faults and is of badly broken up strata that have been pushed over towards the north-west until they have a south-east dip on the outcrop.

(4) *Devonian* (e) *Black Shale*. This formation may occur as a narrow streak wherever the underlying [d] Red Mountain [Clinton] Formation and the underlying [f] Fort Payne Chert are to be found, though it has been seen in only two places, or one place for certain, in Tuscaloosa county. It is believed to be almost, if not entirely wanting in many places where it ought to be. It shows a thickness of 6 to 8 feet where the McAshan Mountain strip crosses the creek or county line about ¼ mile north-west of old Bucksville. It may be thicker here as debris occurs just to the south-east of this outcropping for some 25 feet to a hard thin ledge of a fine grain ferrugi-

nous gray sandstone. Under or to the south-east of this ledge for about 3 feet, to an other similar ledge, though thicker, being 10 to 12 inches thick, there is a hard rock that under the water has a greenish appearance. The debris between these strata and the visible Black Shale, an old fish trap dam, doubtless covers either similar strata or Black Shale or both. It may be that these sandstones, etc., are also Devonian ; if so, the formation is here over 35 feet thick.

On the Birmingham Mineral Railroad, about in the N. W. ¼ of N. E. ¼ of S. 3, T. 21, R. 6 W., there is a badly weathered and broken up outcrop of a black bituminous sandy shale, about 13 feet thick, with interstratified hard thin ledges of a black bituminous ferruginous sandstone in its lower 4 feet. It is hard to say whether this outcrop is (4) Devonian or (6) Upper Subcarboniferous, (g) Oxmoor Shales and Sandstones. It appears to be between a duplication of the (f) Fort Payne Chert, though the chert to the south-east of it or under it is all lose, so far as can be seen, and hence may not be *in situ*.

(5) *Lower Subcarboniferous*, (f) *Fort Payne Chert*. This formation, from 250 to 300 feet thick, does not cover over 3 square miles of the surface area of Tuscaloosa county. It is of the strip along the north-west edge of the Roup or Birmingham Valley and of about one mile, of the portion between the two prongs of Roup's Creek, of the strip on the south-east side of this valley. The strip on the north west side of the valley is duplicated by the McAshan Mountain strip for a short distance down into this county. The McAshan Mountain strip shows a thickness of some 300 feet where it crosses the county line or the creek about ¼ mile north of old Bucksville. Its lower strata are here of very flinty cherty ledges.

This north-west strip is most probably continuous to the south-west, though in places covered up, to the western boundary of S. 17, T. 21, R. 7 W. It is then next seen to the south-west as a covering over the central part or trough of the narrow synclinal that sets in to the north-west of Vance's.

This strip, in places, forms a distinct or separate ridge to itself. The outcrops along the Birmingham Mineral Railroad in the N. W. ¼ of N. E. ¼ of S. 3, T. 21, R. 6 W., are duplicated but as the duplicating part is narrow and is altogether, so far as can be seen, of loose rocks, it may not be a true duplication of bedded strata. In the upper part of this outcrop, there is some beautiful halloysite and some irregular streaks of pyrolusite.

Only one gap has been seen in the strata of this formation in the trough of the narrow synclinal or from the A. G. S. R. R. to the south-west to the Bibb county line, though these strata are covered up for a good part of this distance by the unconformable Cretaceous and Tertiary strata. Along the A. G. S. R. R., there is a short narrow patch of broken up and faulted strata of this formation to the north-west of the above synclinal, as can be seen in the railroad cut in the S. W. ¼ of N. E. ¼ of S. 33, T. 21, R. 7 W.

There is an irregular patch of these strata principally in the N. W. ¼ of S. 1, T. 24, R. 7 E. This is the most south-west place at which the (f) Fort Payne Chert on the north-west side of the Roup's or Birmingham Valley has been seen.

The strip on the south-east side of the valley for its short distance in this county is seemingly perfectly regular.

(6) *Upper Sub-carboniferous*, (g) *Oxmoor Shales and Sandstones*.—This formation, from 800 to 1200 feet thick,

covers about 4 square miles of the surface area of Tuscaloosa county. It is of the north-west side of Roup's Valley with the exception of a very small patch in the fork of the two prongs of Roup's Creek.

The strip on the north-west side of the valley is continuous, though of more or less broken up and faulted strata, to the south-west to within about ½ of a mile of Vances. For some 3 miles to the north-east of Vances, however, its strata are not only badly broken and covered up but are partly faulted out and in places are almost completely so. For over ½ mile both to the north east and south-west of Vance's, it cannot be seen. If present, it is covered up.

After passing Vance's, it is first seen in the faulted anticlinal cove to the north-west of Vance's. It becomes faulted out at the mouth of this cove and continues so for some 4 miles to the south-west, to where it is next seen in the N. E. ¼ of S. 13, T. 22, R. 8 W. To the south-west of this last point, it is covered up by Cretaceous and Tertiary strata, if present, to where it next shows itself in the N. W. ¼ of S W. ¼ of S. 2, T. 24 N. R. 7 E. This is the most south-western place at which it has been seen. This strip has a massive sandstone in its lower strata, under some 300 feet of blackish shales with thin interstratified sandstones.

At the head or south west end of Shades Valley, at Rodgers' Mill (Kimbrall's old mill) near the mouth of Roup's Creek, the strata have a north-west dip and thus show that they are in waves with a north-east and south-west trend, as the general dip is to the south-east.

(7) *Carboniferous*, (h) *Coal Measures*.—This formation, from 4000 to 5000 feet thick, in Tuscaloosa county is wholly of the Warrior Field. It forms the surface of something over ¼ or of about 360 square miles of the

ty. It is known to extend over at least 225 square
s more of the county, under merely a thin covering
nconformable Cretaceous and Tertiary strata. It
races the thickest measures of the Warrior Field with
aximum thickness of nearly 5,000 feet. These
sures are seemingly thickest at and near their south-
end or where they disappear or dip under overlying
aceous and Tertiary strata at and near Tuscaloosa.
r uppermost strata form shoals in the Warrior River
iscaloosa. The lowest down the river of these shoals
ider the bridge between Tuscaloosa and Northport,
n in Plate XIII. This shoal is the first rocky ob-
tion met with in coming up the river and is the
south-west visible Coal Measures or Paleozoic
a in Alabama or of the Appalachian Region These
is are of a massive conglomerate with the coarse
ded flint pebbles in patches and streaks. This con-
ierate has in it also cavities and streaks that are filled
very pure hard cubical coal. It is between coal
is. It is a durable building stone that was exten-
y used in building the three locks at Tuscaloosa.
coffer-dam of Lock No 1, the lowest one down the
, is shown in Plate XIII. The beautiful fossil coal
(Calamite) in the Museum of the Geological
ey, shown in Figure 10, was found imbedded in
rock in the U. S. Government Quarry for supplying
s for the above locks. This specimen is about
t long from tip of pointed root to end of broken
i and about 4 inches in diameter at broken end of
i.

Fig. 10—Calamite from U. S. Government Quarry, Tuscaloosa, Ala.

These Coal Measures carry 12 or more different seams of coal that are each of 2 feet 6 inches and over thick. The 3 of these seams that are being mined gave an output of 208,117 tons of coal for Tuscaloosa county in 1895, and 205, 223 tons for 1896. The coke production of the county for 1895 was 40,814 tons and for 1896, 47,537 tons.

Besides its coal, these measures have the greatest abundance of very fine building and paving stones, very good millstones and whetstone rocks, good pottery and brick clays, and some iron ore. The clay forms the underbeds to most of the coal seams and the best showing of iron ore is in the very bottom strata of the formation. This ore is of a regular stratified seam that on the outcrop is limonite, though doubtless a carbonate within. It has been seen in a couple of places in the anticlinal cove to the north-west of Vance's. It is here porous or honey-comb and is in a ledge from 3 to 4 feet thick. The most of it however is sandy. The following analysis is of an average sample of it, dried at 100 deg. C:

Ferric Oxide...........	40.325
Silica..................	41.372
Phosphoric Acid........	0.492

The millstone rocks have been quarried and worked up in this cove and to the north-east of it.

The Warrior Coal Field has been considered in previous reports and will be considered in a future report, and so this formation need not be dwelt on here.

(8) *Cretaceous*, (i) *Tuscaloosa Formation.*—This formation, if it underlies all of the (9) Tertiary, (j) Layfayette strata, as is most probably the case, extends over ½ or about 745 square miles of the county. It is impossible to tell with any degree of accuracy the surface area that it covers, because its outlines are ragged and because in many places its strata can't be told from those of the overlying (j) Layfayette Formation. It has besides its fine pottery and brick clays, mortar sands, and ballast and macadamizing pebbles, and some limonite. The clays of good quality are in the greatest abundance. They are very similar to the New Jersey clays. The limonite is for the most part very sandy or siliceous and in thin stratified layers, though some little of it is in pockets of boulders, nodules, and pebbles of very good quality. An average sample of its better stratified ore, dried at 100 deg. C., gave the following analysis:

Ferric Oxide...........	47.284
Silica..................	35.511
Phosphoric Acid........	0.167

Analyst, J. L. Beeson.

This analysis is of samples of a compact pinkish red ore, with a red streak, that resembles *turgite*, from the S. E. ¼ of S. 10, and N. E. ¼ of S. 15, T. 24 N., R. 7 E.

This formation has been considered in detail in the *Coastal Plain Report*, published in 1894.

(9) *Tertiary*, (j) *Lafayette Formation.*—It would be impossible to say how much of Tuscaloosa county this formation covers, as its outlines are very irregular and as in many places its strata can't be distinguished from those of the underlying (i) Tuscaloosa Formation. Besides its rounded pebbles that are well suited for ballasting and macadamzing and its fine mortar sands, it has some limonite. Its good limonite, however in this county, is in too small quantity to be of any economic value. This formation has also been considered in detail in the *Coastal Plain Report*.

CHAPTER X.

BIBB COUNTY.

geological formations exposed in this county are ows:

ary	[l] *Lafayette.*	
ceous	[k] *Tuscaloosa.*	
niferous	[j] *Coal Measures*	4000-4500 feet
r Sub-carboniferous	[i] *Oxmoor Shales and Sandstones*	600-1000 feet
r Sub-carboniferous	[h] *Fort Payne Chert*	50-175 feet
ian	[g] *Black Shale*	...
r Silurian	[f] *Red Mountain (Clinton) Formation*	10-375 feet
r Silurian	[e] *Pelham [Trenton] Limestones*	600-1500 feet
	[d] *Siliceous [Knox] Dolomite and Chert*	2000-3000 feet
rian	[c] *Coosa [Flatwood] Shales and Limestones*	300-400+feet
	[b] *Montevallo [Variegated] Shales and Sandstones*	2000+feet
	[a] *Weisner [Chilhowee] Quartzite.*	

Cambrian.—This group, with a visible thickness 2500 feet, is known to extend over some 30 square f Bibb county, though some ⅘ of this area has a uperficial covering of unconformable Cretaceous rtiary strata. It occurs on both sides of the Coal Field or in both the Roup's Valley, the vest end of the Birmingham Valley, and the Cahaey. So far as has been seen, the portion in Roup's

Valley is all of the (c) *Coosa* (*Flatwood*) *Shales and Limestones* and the portion in the Cahaba Valley is of the (b) *Montevallo* (*Variegated*) *Shales and Sandstones* with the exception of a small patch of (a) *Weisner* (*Chlihowee*) *Quartzite.*

(a) *Weisner* (*Chilhowee*) *Quartzite.*—The only place that this formation shows in Bibb county, so far as known, is where it crosses Six Mile Creek in the south-east corner of T. 23, R. 12 E. It shows here as variegated shales with interstratified seams of sandstones, and conglomerates. The sandstones, quartzitic, are of red and gray colors with streaks and specks of milky flint. The conglomerates are a mere mass of small rounded flint pebbles.

[b] *Montevallo* [*Variegated*] *Shales and Sandstones.* This formation in Bibb county, some 2000† feet thick, is confined to the south-east of the Cahaba Coal Field. It covers all of 20 square miles of the surface area of the county, though some ¾ of this area has a thin covering of unconformable Cretaceous and Tertiary strata. It is of two strips or belts. One of these belts, with an average width of about a mile, extends from the county line north-west of Brierfield to the south-west to Centerville. The other belt some 3 miles wide can be seen in this county only as it crosses Six Mile Creek in the south-west corner of T. 23, R. 12 E. The first named of these belts is bounded on the north-west by a fault along which it is in contact with [j] Coal Measures at its north-east end, then with [e] Pelham [Trenton] Limestones for some 6 miles to the south-west, and then with [d] Siliceous [Knox] Dolomite and Chert to the Cahaba River at Centerville where it becomes covered up for good by Cretaceous and Tertiary strata.

[c] *Coosa* [*Flatwood*] *Shales and Limestones.* This formation in Bibb County, from 300 to 400 † feet thick, has

been seen or recognized only in Roup's Valley, though there may be some narrow strips of it in the Cahaba Valley along the south-east edges of the belts of [b] Montevallo (Variegated) Shales and Sandstones and along the scuth-east edge of the Cahaba Coal Field at its south-west end.

Those of Roup's Valley extend over some 6 to 8 square miles, though some ¾ of this area has a thin covering of unconformable Cretaceous and Tertiary strata. Most of their visible outcrops appear to be near the tops of anticlinals or great waves with a north-east and south-west trend. The outcrops of their uppermost strata show in many places in red and mulatto loams as fragments of hard bony looking shaly chert that have doubtless come from thin interstratified cherty seams. The massive limestone breccia near the top of the formation also shows in many places. A dark blue massive limestone with overlying shaly and thin bedded limestones form a bluff some 75 feet high in the S. W. ¼ of S. 11, T 21, R. 6 W. Between this bluff and Greenpond, in the overlying red sandy loam, there are numerous limonite old diggings. The *Edward's limonite banks*, north of Woodstock, mostly in Bibb county, also overlie the rocks of this formation. Just south of these banks and on the east side of the Birmingham Mineral R. R., there is an old quarry in an outcropping of the hard compact limestone breccia with interstratified seams of shaly and thin flaggy limestones. This breccia is said to carry only 5% of silica. The hard thin bedded blackish blue limestones with interstratified seams of blackish shales make a fine outcropping along the Blocton R. R. just south-east of Woodstock. The strata here and in the above old quarry are in waves with a north-east and south-west trend.

[2] *Lower Silurian.* This group, from 3000 to 4500 feet thick,is known to extend over some 115 square miles of Bibb county, though over ⅓ of this area is under a thin covering of unconformable Cretaceous and Tertiary strata. It doubtless under this unconformable superficial covering, extends over much more of the county. It occurs in both the Roup's Valley and the Cahaba Valley and is of [e] *Pelham* [*Trenton*] *Limestones* and [d] *Siliceous* [*Knox*] *Dolomite and Chert.*

[d] *Siliceous* [*Knox*] *Dolomite and Chert.* This formation in Bibb county is from 2000 to 3000 feet thick. In the Roup's Valley, it is known to extend over some 40 square miles though some 30 square miles of this area has a thin covering of the unconformable Cretaceous and Tertiary strata; in the Cahaba Valley, it is known to extend over some 60 square miles of Bibb county though all of this area, with the exception of about 25 square miles, is under a thin covering of the unconformable Cretaceous and Tertiary strata. It doubtless covers much more of the county, in both the Roup and Cahaba valleys, under the overlying unconformable superficial strata.

In Roup's Valley, it is of one wide belt that gradually broadens towards the south-west. In this belt near the county line to the south-east of Greenpond, there are several small limonite diggings from which seemingly considerable ore has been taken, though there is but little ore over the surface. The ore is honeycomb and of good quality. To the south-west, on Caffee's Creek in the S. E. ¼ of S. 14, T. 21, R. 6 W., there is a large deposit of limonite about ½ mile long from north-east to south-west. The good ore of this deposit is mixed however in places with a rough or sandy ore in large boulders. Much of this limonite is spongy and some of it is manganiferous. The following analysis of an average sample shows the ore of this deposit :

Ferric Oxide	15.850
Silica	68.212
Phosphoric Acid	1.270

Analyst, J. L. Beeson.

On the Blocton Railroad in the S. E. ¼ of S. E. ¼ of S. 15, T. 21, R. 6 W., there is an other deposit of limonite in boulders.

To the north-west of this belt or to the north and west of Greenpond, there are numerous large limonite diggings. This limonite, though it is now in [8] Cretaceous, [k] Tuscaloosa, and [9] Testiary, [l] Lafayette loams, and overlies [1] Cambrian, [c] Coosa or Flatwood Shales and Limestones, doubtless derived its iron from the disintrgeation of the rocks of this formation. In some of these old diggings, there is now a good showing of ore, while in others there is but very little visible ore. The ore of the Edward's banks north of Woodstock is also in [8] Cretaceous, [k] Tuscalsosa, and [9] Tertiary, [l] Lafayette loams, over [1] Cambrian, [c] Coosa or Flatwood Shales and Limestones, though it too doubtless derived most, at least, of its iron from the strata of this formation.

The chert of this belt in places, as in the S. E. ¼ of S. 27, T. 21, R. 6 W., is full of cavities that are lined with quartz crystals. The lower strata of this belt, quite pure dolomites, form a low flat divide between the waters of Hill's, Shult's and Big Sandy creeks, that is noted for its number of lime sinks. The dolomites show in and around these sinks, elsewhere they are for the most part covered up by a thin covering of the unconformable (8) Cretaceous and (9) Tertiary strata that form many potato-hill like knolls. There is also around some of these sinks a little limonite, loose chert, and ferruginous sandstone. The growth of this divide is post and white oaks, hickory, red elum, dogwood, haw, etc. To the south-east of it on a hill of Cretaceous and Tertiary loams in the N. W. ¼ of S. W. ¼ of S. 24, T. 22, R. 7 W., some 50 feet above the level of Hill's Creek, there is a very large funnel-shaped sink that doubtless extends down into the rocks of this formation. This sink holds water like a jug and is about 125 yards broad at the level of the water some 25 feet below its top. The water is very deep and so it has a blue color and the sink is known as the *blue pond*. Some 300 yards to the south-west and about 10 feet lower than the water level of this sink, there is an other large sink.

This formation in the Cahaba Valley in Bibb county is of two broad belts. The north-west of these two belts is in contact on the north-west, along a big fault, with the Coal Measures of the Cahaba Field, and is separated from the other belt on the south-east by a faulted synclinal and anticlinal from 1 to 2 miles broad of (b) Montevallo (Variegated) Shales and Sandstones and (c) Pelham (Trenton) Limestones, with ,north of Centerville, a small basin of Sub-carboniferous strata. The lower rocks of this north-west belt, cherty dolomites, in many of their weathered outcrops along the edge of the Cahaba Coal Field, are broken up into small pieces and form naked cedar glades. These limestones may belong partly to (e) Coosa (Flatwood) Shales and Limestones. This belt carries many deposits of limonite. It has deposits of this ore on both sides of Little Cahaba River near the line between R's 10 & 11 E., that furnished the ore for a bloomery, that was run during the ate war, on the little Cahaba River in the N. W. ¼ of N. W. ¼ of S. 24, T. 24, R. 10 E. A deposit on the north side of Little Cahaba River along near the edge of the Cahaba Coal Field in the eastern part of S. 13, T. 24, R. 10 E., is thus spoken of by the State Geologist in his report for 1875:

"Of the limonites found in the first belt of Dolomite mentioned above, the banks in S. 13, T. 24, R. 10 E., lie nearest the coal field..... Near the most westerly of these banks, a capping of ferruginous sand-stone, and sometimes of a ferruginous conglomerate...... is found covering the summit of hills of Carboniferous sandstone. Here, though the hills are mainly the sandstone, there is a superficial covering of pebbles and ferruginous rock which I am inclined to believe is of much later date. At any rate, on one of the hills which has this capping of a ferruginous sandstone or conglomerate, too siliceous to be of value as an ore of iron, an improvement in the quality of the ore may easily be noticed as one descends the hill, and about half-way down it has been regularly worked. At this point the surface ore has frequently grains of sand, and in some cases quartz pebbles enclosed in it; but by excavating a few feet, very excellent qualities of limonite, fibrous, ochreous, and compact (liver ore), are brought to light. This locality, for convenience, may be called No. 1. The old Bright-hope bloomery on the Little Cahaba, a few miles distant, was supplied in part by ore from this bank."

"The Bright-hope bloomery above referred to was also partly supplied with ore from several other pits close to No. 1.

"One of these pits, No. 2, is in the valley at the foot of the hill on which No. 1 is located.

"Higher up, on the side of another hill, are other banks from which ore has likewise been extracted for the bloomery." These banks are No. 3.

The following analysis, taken from the above report, made by Mr. J. Blodgett Britton of Philadelphia, are of the above ores:

	(1)	(2)	(3)	(4)
Silica	6.04	3.06	7.84	5.61
Ferric Oxide	79.93	82.84	73.10	78.63
Water	10.49	7.41	12.44	12.72
Sulphur	None.	0.45	None.	None.
Phosphoric Acid	1.01	0.55	1.35	1.30
Alumina	1.43	0.35	1.47	1.36
Lime	0.07	1.02	0.11	0.06
Magnesia	Trace.	0.19	0.12	0.10
Oxide of Manganese	0.92	0.95	3.36	0.11
Undetermined & Loss	0.11	3.18	0.21	0.11
Total	100.00	100.00	100.00	100.00
Metallic Iron	56.10	57.91	51.96	55.05
Phosphorus	0.45	0.24	0.58	0.57

(1) Average sampe from Bank No. 1.

(2) The compact liver brown ore, breaking with a conchoidal fracture, from Bank No 1.

(3) Average sample from Bank No. 2.

(4) Average sample from Bank No. 3.

"A short distance from the ore banks just described, in a ridge composed of chert of the Quebec or Knox Dolomite, is a deposit of *pipe ore*, the extent of which is, as yet, not known, since only the outcroppings of it have been examined. This ore differs materially from those mentioned above. It occurs in stalactitic, botryoidal masses; outer surface brown, giving cherry red powder; mass of the ore reddish brown, affording a dark red powder.

"My analysis of this ore shows the following composition in 100 parts:

Specific Gravity	*3.78*
Combined Water	8.54
Siliceous Matter	2.34
Ferric Oxide	87.49
Alumina	0.27
Oxide of Manganese	0.12
Lime	0.82
Magnesia	0.33
Phosphoric Acid	Trace
Sulphur	0.48
Total	100.39

"About one and a half miles south-east of these ore banks,—— in S. 19, T. 24, R. 11 E., is the Owen Bank. ——The ore here is limonite and covers considerable area. As yet, no explorations of the ore have been made, and the quality of the ore is known only from surface specimens. Most of the pieces are hollow, the cavities being filled usually with yellow ochre, though sometimes with a yellow sand.

"Adjoining the Owen tract, on the land of Mr. Wallace, is also a very considerable show of the surface specimens of limonite, of the same character with those last described.

"Both of these localities are immediately adjacent to the belt of Chazy Limestones which will afford good material for fluxing.

"Of other limonite banks, in this western belt of Dolomite, I may mention the following:

"In S. 26, T. 24, R. 10 E.——the limonite is dark bluish, probably from manganese. Many specimens are botryoidal and covered with a black glaze. Near this place the worn pebbles of the Drift* cover the hill tops, and many fragments of ferruginous sandstone, apparently belonging to the Drift, may be noticed.——Same section and about half a mile distant, is a large exposure of limonite, fibrous and compact varieties. The rounded pebbles, ferruginous sandstone, and ferruging conglomerate (pebbles cemented together by brown iron ore) of the Drift, cover the ground here; and the ferruginous sandstone, like that of the Drift, is one extreme of a series of ferruginous rocks, of which pure, fibrous and compact limonite, with little or no admixture of sand grains, is the other. If the pebbles, conglomerate, ferruginous sandstone, and limonite do not belong to the same period, it is difficult to draw any line between the ferruginous sandstones on the one hand and the iron ores on the other.

The following is an analysis of this last named ore by Mr. Britton:

Ferric Oxide	71.15
Water	10.49
Insoluble Siliceous Matter	14.11
Sulphur	None
Phosphoric Acid	0.80
Alumina	2.65
Lime	0.11
Magnesia	0.07
Oxide of Manganese	0.41
Undetermined & Loss	0.21
Total	100.00
Metallic Iron	50.07
Phosphorus	0.35

"In S. 34, T. 24, R. 10 E.,——there is also an occur-

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*The word *Drift* in this report of 1875 refers to the superficial covering of Lafayette and Tuscaloosa strata. McC.

rence of limonite, showing the same varieties as that last mentioned. These two banks are probably identical, as they lie adjacent to each other. They are both contiguous to the Chazy belt, and hence in reach of good limestone.

"——Two miles north of Blake's Ferry, on the Cahaba, I am informed, there is another limonite bank. So, also, below Pratt's Ferry."

The State Geologist in the above report, page 95, speaks of *barite* or *heavy spar* occurring in veins in the rocks of this formation at the McGuire Shoals on the Little Cahaba River, and at the "Sinks," on Six Mile Creek.

Large boulders of impure limonite with cherty pebbles lie scattered over the broken country of cherty ridges in the S. W. ¼ of S. 30, T. 24, R 10 E.

Deposits of a very good soft *pot ore* occur along for several miles to the north-east of Shultz's Creek, near the north-west edge of this belt. These deposits furnished ore during the late war for a bloomery on Shultz's Creek. An average sample of this ore, dried at 110 deg. C., gave the following partial analysis:

Ferric Oxide	71.688
Silica	4.341
Phosphoric Acid	3.564

This analysis shows the ore to be remarkably high in Phosphoric Acid, almost high enough for the ore to be termed a phosphate.

This north-west belt to the north-west of Centerville, a very broken country, is of a broad unsymmetrical synclinal with steep and broken up strata along its south-east edge that extend as a point sevearal miles to the north-east, to the south-east of the little basin of Subcarboniferous strata.

The most south-western rocks of this belt that have been seen are along the Scottsville and Centerville road. Some of them, in the N. E. ¼ of S. 5, T. 23, R. 9 E., are masses of cherty breccia or of angular pieces of chert held together by a siliceous dolomite that is raspy on the weathered surfaces. Some of the chert has cavities in it that are lined with quartz crystals.

The cherty dolomites along the south-east edge of this belt in their outcrops just below and above the Centerville bridge form the first rocky obstructions to navigation in the Cahaba River.

The south-east belt of this formation in the Cahaba Valley, in Bibb County, is almost completely hid by Cretaceous and Tertiary strata, except along Mahan and Six Mile creeks. The weathered outcrops of its dolomites near Bibb Furnace have a slight resemblance to *cypress-knees*.

This belt has over it some deposits of good limonite. These deposits are in (k) Tuscaloosa and (l) Lafayette loams, though their iron has been derived, mainly at least, from the strata of this formation. The most important of these banks are those in S's 21, 22, & 26, T. 24, R. 11 E., which have furnished the ore for the Bibb Furnace since its first erection in 1862. This ore is of fine quality, as evicenced by the enviable reputation of the Bibb Furdace iron. The following partial analyses are of samples of it, dried at 100 deg. C:

	(1)	(2)	(3)	(4)
Ferric Oxide.........	74.540	81.421	78.945	57.459
Silica...............	7.442	1.133	3.043	34.423
Phosphoric Acid.....	1.389	0.863	2.3 1	
Oxide of Manganese..				0.278

(1) An average sample of the ore of the banks in the S. W. ¼ of N. W. ¼ of S. 27, T. 24, R. 11 E.

(2) A compact ore with a slight metallic appearance and with ir-

irregular velvety looking seams. Locality:—Mechanis' Bank. Collector—Col. T. J. Peter, Brierfield.

(3) Labeled:—From hill opposite Bibb Furnace. Collected by Col. T. J. Peter.

(4) A concretionary limonite with the cavities lind with a fibrous limonite and holding a well leached white siliceous or cherty rocky material with over 97 per cent. of silica.

A limonite bank occurs also in S. 31, T. 24, R. 11 E. The State Geologist in his report for 1876, in speaking of the above ore bank, says:

"All the beds of ordinary limonite described above, occur in clay, usually red or yellowish red, with sometimes white streaks. The ore lies without any apparent regularity, in larger or smaller lumps, in the clay. The concretionary origin of the limonite is apparent in most of the fragments."

The siliceous powder from the grinding up of the cherty nodules, after being roasted, of this belt, from near Ashby, are mixed with (k) Tuscaloosa clays and made into fire bricks. These bricks have been tested at the Watertown Arsenal with results as given in the following table:

Test of Bricks for John Elarker, Ashby, Ala.

(Compressed Surfaces faced with Plaster of Paris.)

No. of Test.	Description	Dimensions.		Sectional Area.	First Crack.	Ultimate Strength.	
		Height.	Comp'd Surface.			Total.	Per Sq. Inch.
		Inches.	Inches.	Sq. In's.	Lbs.	Lbs	Lbs.
7630	Arch Brick No. 2 [two bricks tgether]	(2.67 x 2 67) 5.35 in.	4.43x913	40.45	99.00	104.800	25[illegible] 1
7631	Bullhead Brick No. 3	2.55	½(3.84+ 4 94) x 9.61	42.19	117.000	140.500	333[illegible]
7632	"	2.50	½(3.88+ 4.89) x 9.55	41.88	86.000	114.900	274[illegible]
7633	"	2.65	½(3.90+ 4.93) x 9.00	42.88	88.000	129,800	306[illegible]
7634	Rim Brick No. 4	2.60	½(4.15+ 4.61) x 9.14	40.03	124.000	148,400	370[illegible]
7635	" " "	2.60	½(4.08+ 4.58) x 9.14	39.58	91.000	152 100	384[illegible]
7636	" " "	2.63	½(4.20+ 4 71) x 9.15	40.76	123.000	151.100	370[illegible]

Absorption of Water after being immersed one week.

		Weight Dry.	Absorption of Water.		
			Total.	By Wght. %	By Vol. %
7633	Bullhead Brick No. 3	6 Lbs 13 3/4 oz.	13 3-43	12 5%	21.1%
7636	Rim Brick No 4	6 Lbs. 4 1/2 oz.	13 1-43	13 1%	21 3%

(e) *Pelham* (*Trenton*) *Limestones.* This formation, from 600 to 1600 feet thick, extends over, at the least, 25 square miles of Bibb county, though from 8 to 10 sq. miles of this area are covered up by the unconformable aceous and Tertiary strata. It occurs on both sides e Cahaba Coal Field or in both the Roup and Ca- a valleys.

the Roup's Valley, it is of two strips, one on the h-east side and the other on the north-west side of valley. The south-east strip has been seen as o the south-west as the southern part of S. 19,T. 22, W. It doubtless extends, at the least, 5 to 6 miles her to the south-west, though completely covered up he overlying unconformable Cretaceous and Tertiary ta. The north-west strip of the valley runs across extreme north-west corner of the county. The ningly last or most south-west 3 to 4 miles of this h-west strip is in Bibb county, though it can be in only three patches. One of these is the glady rop known as the *lime kilns*, spoken of under Tusca- a county, which is partly in this county, and the r two are along branches, one in S. 20, T. 22 S., 7 W., and the other in S. 6. T. 24 N., R. 8 E.

the Cahaba Valley, this formation is of two belts. north-west of these belts, bounted on the south- by a fault, sets in at the edge of the Coal Measures he S. E. ¼ of S. 10, T. 24, R. 11 E., and extends to south-west until it bends around the south-west end the little synclinal basin of Sub-carboniferous a to the north of Centerville. The south-east has not been seen at all in this county, gh it shows just beyond the eartern boundary of the ty, as it crosses Mahan Creek. Some of its strata show along the county line in the south-east corner 2, T. 24, R. 12 E., and in the north-east corner of T. 23, R. 12 E., and as it crosses Six Mile Creek t in S. 16, T. 23, R. 11 E.

he north-west belt, in contact along the fault on the south-east with (b) Montevallo (Variegated) Shales and Sandstones, broadens to the south-west until, at the crossing of the Cahaba River or the north-east end of the little synclinal basin of Sub-carboniferous strata, it is over a mile wide. In here and to the south-west, at least, is in a synclinal, though nearly all of its strata on the south-east side of the synclinal opposite to or south-east of the little basin of Sub-carboniferous strata are engulfed in the boundary fault. It is here made up of something like the following strata in decending order.

(6) Slaty or shaly argillaceous limestones that easily split into smooth thin slaty slabs.

(5) A very bitumious blue limestone with calcite streaks, called *black marble.*

(4) A blue argillaceous limestone that weathers smoothly.

(3) A gray limestone, partly shaly and partly slabby.

(2) A crystalline gray limestone, in places *a very good white or light gray marble.* Sometimes a *variegated marble.*

(1) A compact blue limestone.

This belt shows many naked outcrops and forms many cedar glades. In the outcrops of its upper strata, corresponding doubtless to (4) and (5) of the above section, in the N. E. ¼ of S. 20, T. 24, R. 11 E., there are two quarries that have furnshed the fluxing rock for the Bibb Furnace. The rock of these quarries is a blackish or bitumious blue fossilliferous limestone with calcite streaks. An average sample of it in the old or un-used quarry, the north-east one, dried at 100 deg. C., gave the following analysis:

Insoluble Matter (Silica, etc.) in dilute HCl	12.300
Ferric Oxide, Alumina, and Maganese Oxide	1.360
Lime	45.42
Magnesia	2.709
Carbonic Acid	39.550

Near the south-west of these two quarries or in the northern part of S. 20, T. 24, R. 11 E., there is an outcropping of the lower strata, of *light gray marble*. These marble strata have been seen over considerable area to to the south-west. They are variegated in places. They sometimes carry calcite streaks and interstatified thin argillaceous seams, and are sometimes weathered into furrows and ridges. In an outcropping of them in the north-east part of S. 34, T. 24, R. 10 E., there is some *barite* or *heavy spar*. The *black marble* or blackish bituminous blue limestone with calcite streaks crops out along a branch in the S. W. ¼ of S. 33, T. 24, R. 10 E. The variegated marble has been quarried extensively on the north bank of the Cahaba River in the N. W. ¼ of S. 32, T. 24, R. 10 E., where it appears to be about 60 feet thick. It takes a fine polish and some of it is a beautiful rock. It carries red ochre stained streaks, some of which are an inch or more wide. It has in it also a very ferruginous or ochre like seam that from the outcrop would be taken to be several feet thick. It has been used but little except for monuments. Over this variegated marble of the quarry, there is first an inferior light gray mable about 60 feet thick and then a dark gray limestone that must be some 300 feet thick. Under the variegates marble, there is a sandy or siliceous limestone that is called a bastard limestone.

The marble, of variegated and white colors, is almost continuous in its outcrops from the above quarry for some two miles down the river. Its most south-west outcrop that has been seen is in the S. W. ¼ of S. W. ¼ of S. 31, T. 24, R. 10 E. Near this last outcropping or about in the S. E. ¼ of S. W. ¼ of S. 31, T. 24, R. 10 E , there is a seam of red ore that probably corresponds to the very ferruginous or ochre like seam of the above marble quarry. This ore is merely local in its occurrence. It is just under a very fossiliferous gray limestone that is in places a marble and is sometimes variegated; and is just over a cherty or siliceous looking limestone that is also a marble in places. The following analysis is of an average sample of this ore:

Specific Gravity	*2.897*
Water	4.383
Silica	42.251
Ferric Oxide	51.291
Alumina	0.947
Lime	0.993
Magnesia	0.101
Manganese Oxide	0.130
Phosphoric Acid	0.938
Sulphur	0.012
Total	101.046

This red ore occupies the same geological horizon as that spoken of in Chapter III, and in several places under Jefferson county, Chapter IX, as being at the top of the Siliceous (Knox) Dolomite and Chert formation or bottom of Pelham (Trenton) Limestones.

The black slaty argillaceous strata at the top of the formation are in some of the outcrops around the little basin of Sub-carboniferous strata almost fissile enough to be roofing slate. They often resemble very much the (4) Devonian, (g) Black Shale.

(3) *Upper Silurian*, (f) *Red Mountain* (*Clinton*) This formation, from 10 to 375 feet thick, does not cover over 3 to 4 square miles of the surface area of Bibb county. It occurs both to the north-west and south-east of the Cahaba Coal Field. In Roup's Valley, it is of the strip of this formation along the south-east edge of the valley,

and of a very small portion of the strip on on the north-west side of the valley along the county line in the extreme north-west corner of the county. The south-east strip is seemingly perfectly regular so far as it can be seen. Its strata have been seen as far to the south-west as just below the crossing of Hill's Creek in the S. W. ¼ of S. W. ¼ of S. 20, T. 22, R. 6 W. To the south-west of this point, and in places to the north-east, it is completely covered up by the unconformable Cretaceous and Tertiary strata. At its north-east end or for some 3 miles to the south-west of Roup's Creek, it is split by the county line and is mostly in Tuscaloosa county, the county line for this distance being along the top of East Red Mountain.

This south-east strip carries two seams of ore that are some 60 feet apart. The upper seam is usually very fossiliferous and is hence called the *fossiliferous seam*. It, near the north-east end of the strip or the county line on the north-east, is about 3 feet thick.

This strip to the south-west or from about the N. W. ¼ of S. W. ¼ of S. 5, T. 21, R. 5 W. to the S. E. ¼ of N. E. ¼ of S. 13, T. 21, R. 6 W., is too deeply covered by Cretaceous and Tertiary strata for any of its rocks to be seen, though still farther to the south-west both of its ore seams have been exposed in several places. They are each about 6 feet thick. The upper or fossiliferous seam in places is a mass of rounded oolitic grains of about the size of fish eggs. It has shaly partings in its upper half. In a cut on its outcrop in the N. W. ¼ of S. W. ¼ of S. 24, T. 21, R. 6. W., there is the following section :

Section of Cut on Upper Red Ore Seam in the N. W. ¼ of S. W. ¼ of S. 24, T. 21, R. 6 W.

(4) Loam; Tuscaloosa Formation.
(3) *Ore*, Clay; a hard limonite looking ore of red brick-dust color, in several solid ledges or seams, from 1 to 4 inches each in thickness, separated from each other by clayey seams.
(2) *Red Ore; soft* or well leached, with interstatified clayey streaks.......................... 3 ft.
(1) *Red Ore; soft* or well leached, good, about....... 4 ft.

The above outcrop is bent or flattened over towards the north-west until it is in a curve. In a cut here on the outcrop of the lower seam, there is the following section:

Section of Cut on Lower Red Ore Seam in N. W. ¼ of S. W. ¼ of S. 24, T. 21, R. 6 W.

(3) Loam; Tuscaloosa Formation.
(2) *Red Ore; soft* or well leached.................... 2 ft.
(1) *Ore*, Clay; a hard limonite looking ore with clayey partings.............................. 4 ft.

Samples of the two ore seams in the above outcrops, dried at 100 deg. C., gave the following analyses:

	(1)	(2)	(3)
Ferric Oxide..........	87.088	88.385	64.138
Silica................	4.280	5.160	6.485
Phosphoric Acid	trace	0.279	0.192

(1) Average sample of Upper or Fossiliferous Seam. Analyst, J. L. Beeson.

(2) Given by Col. Giles Edwards as an anlysis, by A. F. Brainard, of the Upper or Fossiliferous Seam.

(3) Average sample of the Lower Seam. Analyst, J. L. Beeson.

This formation where crossed by the Blocton Railroad in the S. E. ¼ of S. E. ¼ of S. 34, T. 21, R. 6 W., appears to be over 350 feet thick. It here carries, it is believed, the two seams of ore, but they are thought to be thin. The lower seam shows in two places a thickness of only about 1 foot. Only the loose ore of the upper seam was seen here.

The most south-west strata of this strip that has been seen, sandstones and conglomerates, form a low ridge in the south-west corner of S. 20, T. 22, R. 6 W.

There is an outcropping of *soft* or well leached red ore near the county line in the N. W. ¼ of N. W. ¼ of S. 20, T. 22, R. 7 W., in the small portion in Bibb county of the north-west strip of this formation in Roup's Valley.

In the Cahaba Valley, in Bibb county, there is around the little basin of Sub-carboniferous strata to the north of Centerville a ledge of fine grain bluffy yellowish massive sandstone, from 10 to 12 feet thick, that is believed to be of this formation. There was also noticed over the side of the hill in the N. E. ¼ of N. E. ¼ of S. 20, T. 24, R. 11 E., some loose pieces of yellowish cherty looking sandstones that may be of this formation.

(4) *Devonian*, (g) *Black Shale*. This formation doubtless occurs in Bibb county, though it has not been seen. It is not believed to occur, however, to the south-east of the Cahaba Coal Field or in the Cahaba Valley in this county.

(5) *Lower Sub-carboniferous*, (h) *Fort Payne Chert*. This formation, from 50 to 175 feet thick, entends over, at the least, 8 to 10 square miles of Bibb county, though nearly ⅓ of this area is covered up by the unconformable superficial Cretaceous and Tertiary strata. It occurs in both the Roup and Cahaba valleys.

In Roup's Valley, it is confined, in Bibb county, to one belt along the south-east edge of the valley. This belt, so far as its strata can be seen or as far to the south-west as the crossing of Hill's Creek in the north-west corner of S. 29, T. 22, R. 6 W., is perfectly regular.

In the Cahaba Valley, the only place in which this formation occurs in Bibb county is around the little basin of Sub-carboniferous strata in the north-west corner of T. 23, R. 10 E. It is here some 150 feet thick and in many places the hard cherty ledges near its bottom crop out in bluffs. In its upper strata, on the north-west side of the basin in the S. W. ¼ of N. W. ¼ of S. 5, T. 23, R. 10 E., there is considerable limonite. An average sample of this ore, dried at 110 deg. C., gave the following analysis :

Ferric Oxide	66.951
Silica	11.724
Phosphoric Acid	2.803

This analysis shows the ore to be unusually high in phosphorus. It is mainly a porous ore and some of it is nothing more than a ferruginous chert. Among the chert nodules on top of the ridge, there is some pyrolusite ore in the S. E. ¼ of S. E. ¼ of S. 7, T. 23, R.10 E..and much jasper, chalcedony, etc., in considerable boulders, in the N. E. ¼ of N. E. ¼ of S. 5, T. 23, R. 10 E.

(6) *Upper Sub-carboniferous*, (i) *Oxmoor Shales and Sandstones*. This formation, from 600 to 1000 feet thick, extends over some 10 square miles of Bibb county, though several square miles of this area is covered up by Cretaceous and Tertiary strata. It occurs on both sides of the Cahaba Coal Field or in both the Roup and Cahaba valleys. In Roup's Valley, it appears to be some

1500 feet thick, forming a narrow broken valley along the north-west edge of the Cahaba Coal Field. It carries, in places, some interstratified limestones. The most south-west of these limestones that have been seen, is in the S. W. ¼ of S. W. ¼ of S. 24, T. 21, R. 6 W.

In the Cahaba Valley, the only place in which these strata occur in Bibb County is in the little basin in the north-west corner of T. 23, R. 10 E. They here, mainly very black carbonaceous shales, also carry some interstratified limestones in places in their lower part. Some of these limestones are slabby and very fossiliferous, while others are massive and but very slightly fossiliferous. Over an outcropping of them on the north-west side of the basin in the S. W. ¼ of N. W. ¼ of S. 5, T. 23, R. 10 E., there is a considerable deposit of loose limonite that may be partly of this formation, though it is believed to have come mostly from the upper strata of the underlying formation. See analysis under (h) Fort Payne Chert. There is some siliceous or sandy stratified limonite in the lower strata of this formation in the S. W. ¼ of N. E. ¼ of S. 7, T. 23, R. 10 E.

(7) *Carboniferous*, (j) *Coal Measures*. This formation, from 4000 to 4500 feet thick, forms at least 50 square miles of Bibb County, and is known to extend over at least 50 square miles more of the county under a thin covering of unconformable superficial Cretaceous and Tertiary strata. It is wholly of the Cahaba Coal Field, embracing the Blocton Basin and most of the Daily Creek Basin. It, according to the report of Mr. Jos. Squire, carries the most productive measures of the Cahaba Field, measures with some 40 coal seams of which 14 seams are of workable thickness or have 2 feet 6 inches and over each in thickness of coal. For a detail description of this formation in Bibb County, the reader

is respectfully referred to Mr. Squire's report. The coal and coke production of this county, given by the State Mine Inspector, was for 1895 respectively 653,762 tons and 168,196 tons, and for 1896 respectively 710,842 tons and 52,019 tons.

(8) *Cretaceous*, (k) *Tuscaloosa Formation*. This formation, if it underlies all of the (9) Tertiary, (l) Lafayette strata, extends over some 2-3 or 415 square miles of Bibb County. It includes some, if not most of the limonite banks that have been described under the (d) Siliceous (Knox) Dolomite and Chert Formation. Its stiff, putty-like, laminated gray clays have been mined quite extensively in several places within the county. These clays have been used principally as a cementing material in the manufacture of fire bricks that are well suited for ordinary purposes or for anything else than the lining of furnaces. These clay banks occur along the Birmingham Mineral and Alabama Great Southern railroads respectively to the north and west of Woodstock, and along the East Tenn.. Va. & Ga. R. R. to the south of Brierfield. In them, the clay has been seen to a depth of about 12 feet, though it is cut up by some thin interstratified seams of sand. The clay usually has a covering of deep red sandy loam, 10 to 12 feet thick, that is believed to be of the (9) Tertiary, (l) Lafayette Formation. Some of these laminated unctuous clays however are stained pinkish with iron and sometimes manganese, and some have a dark color from the presence of organic matter which can be easily burnt out. They, in some of the beds, are in wrinkles or waves.

(9) *Tertiary*, (l) *Lafayette Formation*. In our present state of knowledge, it would be impossible to say how much of Bibb County this formation covers. It possibly includes some of the limonite banks that have al-

been considered. It also doubtless comprises, least, of the flaggy and massive sandstones that ver the broken piney woods country in the south- part of the county. These sandstones and con- tes are ferruginous enough in places to be very n ore. An average sample of the most ferrugin- hem over the hills about a mile west of Scotts- being dried at 110 deg. C., gave the following :

Ferric Oxide	58.573
Silica	17.084
Phosphoric Acid	1.279

ounded pebbles of this formation have been ex- y used as a ballast on the A. G. S. R. R.

CHAPTER XI.

SHELBY COUNTY.

The geological formations that have been recognized in Shelby County are as follows:

(8) *Tertiary*	(k) *Lafayette*	
(7) *Cretaceous*	(j) *Tuscaloosa*	
(6) *Carboniferous*	(i) *Coal Measures*	5000 feet
(5) *Upper Sub-carboniferous*	(h) *Oxmoor Shales and Sandstones*	1200–1800 feet
(4) *Lower Sub-carboniferous*	(g) *Fort Payne Chert*	0–150 feet
(3) *Lower Silurian*	(f) *Pelham (Trenton) Limestones*	1000–1800 feet
	(e) *Siliceous [Knox] Dolomite and Chert*	2500–3500 feet
(2) *Cambrian*	[d] *Coosa [Flatwood] Shales and Limestones*	150-350 feet
	[c] *Monterallo [Variegated] Shales and Sandstones and Aldrich [Beaver] Limestones*	2500-3000 feet
	[b] *Weisner [Chilhowee] Sandstones and Conglomerates*	1000+ feet
(1) *Crystalline,*	[a] *Talladega [Ocoee] Slates*	

[1] *Crystalline,* [a] *Talladega (Ocoee) Slates.* This formation reaches far enough northward to cover one or two square miles of Shelby County to the south-west of Shelby. This portion of it is made up of black slaty shales with some interstratified quartzites and some concretionary gravels and nodules of white flint.

[2] *Cambrian.* This group, with a visible thickness of some 4000 square feet, covers some 75 square miles of the surface area of the county. It is made up of the three formations, [d] *Coosa (Flatwood) Shales and Limestones*, [c] *Montevallo (Variegated) Shales and Sandstones*, and (b) *Weisner [Chilhowee] Sandstones and Conglomerates.*

[b] *Weisner [Chilhowee] Sandstones and Conglomerates.* This formation, though it shows to a thickness of per-

haps 1000 feet, does not cover over 3 to 4 square miles of the surface area of the county. Its strata make or give prominence to the Columbiana Mountains to the east of Columbiana. This mountain, as it curves around the south-west end of a synclinal basin, is somewhat the shape of a horseshoe with the heels towards the north. It has along its top two ledges of conglomerates that are very massive around the toe of the horseshoe.

In the upper part of this formation, over the conglomerates, there are ferruginous shaly strata that are in places very good red ore. The best of this ore, compact and laminated, breaks up into rhomboidal blocks along seams or joints. Some of it, however, in places, is massive and passes into a ferruginous conglomerate with quartz pebbles the size of small bird shot. These pebbles on a fresh fracture of the conglomerate have a vitreous luster but become white and opaque on weathering. There are three of these ore seams in the Mardus Ferry Road as it decends the eastern slope of the mountain in the S. W.¼ of S. 19, T. 21, R. 1 E., about as in the following outcropping:

Outcropping along the Mardis Ferry Road in S. W. ¼ of S 19, T. 21, R. 1 E.

(12) Shales, Sandstones: variegated shales with some interstratified sandstones.	
(11) *Red Ore*; shaly, a conglomerate in places.	1 ft. 6 in.
(10) Shales; light yellowish and orange, about	20 ft.
(9) *Red Ore*	8 in.
(8) Shale, *Red Ore*; shale with thin seams of ore	3 ft.
(7) *Red Ore*	8 in.
(6) Shale, Debris; about	75 ft.
(5) *Red Ore*; poor, about	1 ft. 6 in.
(4) Debris; about	12 ft.

(3) *Red Ore*, Shales; the ore is shaly, about	4 ft. 0 in.
(2) Shales; light yellowish color, some	100 ft.
(1) Conglomerate; full of small flint pebbles, from	8 to 10 ft.

n the south-east side of the horse-shoe or synclinal
n, or in the S. W. ¼ of S. 29, T. 21, R. 1 E., the out-
s of a seam of very hard and compact red ore has
dug into in several places. In one of the pits, there
e following section :

Section of Test Pit No. 1 in S. W. ¼ of S. 29, T. 21, R. 1 E.

(8) Shales; greenish, about	3 ft.
(7) *Red Ore*, Shales; interstatified, about	1 ft 2 in.
(6) *Red Ore;* compact, about	1 ft. 1 in.
(5) Shale; nearly	2 in.
(4) *Red Ore*; compact	11 in.
(3) Shale	1 in.
(2) *Red Ore*	1 ft 3 in.
(1) Shales.	

his seam of ore in another test pit, about 40 feet to
south-east, shows up as in the following section :

Section of Test Pit No 2 in S. W. ¼ of S. 29, T. 21, R. 1 E.

(7) Debris.	
(6) *Red Ore;* very fine, visible for about	7 in.
(5) Shale; about	3 in.
(4) *Red Ore*, Shale; the ore is shaly	1 ft. 6 in
(3) Shale; dove and greenish colors.	9 in.
(2) *Red Ore;* not very good	1 ft. 2 in.
(1) Debris.	

The following analyses have been made of this ore:

	(1)	(2)	(3)	(4)
Ferric Oxide..........	67.73	70.09	76.87	43.840
Silica	29.06	23.45	20.74	31.594
Sulphur................	0.00	0.11	.....	......
Phosphoric Acid........	0.69	0.77	trace-	0.453
Alumina	3.66	5.58	1.55	......
Manganese Oxide.......	1.00	.....	0.51	......

(1) From the State Geologist Report for 1876. Analyst:—J. B. Britton.

(2) From the State Geologist Report for 1876. Analyst:—Dr. Chandler.

(3) From Prof. Tuomey's Second Biennial Report.

(4) Average sample of the ore in the above two test pits, dried at 100 deg. C., not near so good in quality as the cabinet or picked specimens.

(c) *Montevallo (Variegated) Shales and Sandstones, and Aldrich (Beaver) Limestons.*—This formation, from 1500 to 3000 feet thick, comprises most or over 50 square miles of the surface area of the Cambrian strata in Shelby county. It forms a belt along the south-east edge of the Cahaba Coal Field; the *stump hills* or broken country between Calera and Shelby, including the synclinal basin of the Columbiana Mountain; and patches in the Coosa Valley proper to the north of the E. T. Va., and Ga R. R.

The belt along the south-east edge of the Cahaba Coal Field spreads out over the top of an anticlinal just to the north of Montevallo but in a short distance farther north becomes engulfed in a fault for some 4 miles or to nearly west of Siluria. It is then continuous to the north-east, along the fault, to the county line, though very narrow or almost engulfed in the fault in places. It shows interstratified in its upper strata, both to the north-east of Montevallo and in the south-east edge of Helena, compact blue limestones, mostly thin bedded, with argillaceous bands. These limestones pass gradually into the shales, becoming first thin bedded and then shaly. In the middle strata of this belt, there are in places some massive or thick bedded variegated, usually yellowish, calcareous and often shaly looking sandstones. These sandstones make a fine outcropping at the mill dam in Helena. To the north-east, they in places form a sharp crested ridge. They, like the above limestones, also gradually pass into shales. The bottom strata of the formation, the Aldrich (Beaver) Limestones, are typical in their development and exposure, and in their physical and chemical characteristics, along the north-west edge of the belt near Aldrich. They are here exposed to a maximum thickness of perhaps near 500 feet notwithstanding that they are partly engulfed in the Rome Cahaba Thrust Fault that bounds them on the northwest and separates them from the Upper Coal Measures of the Cahaba Field. This fault has a vertical displacement here of some 13000 feet, nearly 2½ miles, the greatest in the State. It soon, both to the north-east and south-west, engulfs all of these limestones. These limestones have not been seen anywhere else in the county, though they crop out in other places.

The *stump hills*, of the variegated strata, form a very broken country with a stunted or small growth of hard timber. Its hard strata, both shales and sandstones, crop out in ledges that form irregular ridges and hills. Their prevailing color is chocolate which is often so deep as to give its tint to the soil. The shales however in many places are of a dark or black color and are fissile enough to be very good roofing slates. They are cut up by joints. These slates can be best seen in outcrops along the creeks and branches. The sandstones, often cherty looking and golden colored, are in places so coarse grained as to have an oolitic appearance. They are sometimes full of white flint streaks. Limestone or marble also occurs in the *stump hills*. In the N. W. ¼ of N. E. ¼ of S. 8, T. 24, R. 14 E., there is an outcrop 25 to 30 feet thick of a variegated or dark blood red colored marble with white and greenish irregular streaks and splotches. This marble is very hard and takes a good polish. Its weathered surfaces, with a raspy feeling, have striae running over them. All of the strata of the stump hills are somewhat metamorphosed.

The Shelby limonite banks are along the east edge of the *stump hills*, though they are believed to be separated from them by a great fault and to overlie higher strata or strata at the bottom of the [e] Siliceous [Knox] Dolomite and Chert Formation.

Vincent on the Columbus and Western Railroad is partly built on a patch of variegated shales and sandstones. The yellowish ochreous sandstones of this patch, in an outcropping just to the south-east of the town, have been quarried and used for building purposes. They are called "fire rock", because they will stand fire. This patch of variegated strata is at the northern end of an oval-shaped body of [d] Coosa [Flatwood] Shales and Limestones.

[d] *Coosa Flatwood Shales and Limestones*. This formation in Shelby county, from 150 to 350 feet thick, is of the above oval-shaped body to the south of Vincent and of a narrow valley or strip along just to the south-east of the belt of [c] Montevallo [Variegated] Shales and Sandstones just to the south-east of the Cahaba Coal Field, and of patches along Beeswax Creek and one along the Valley Road near Kelly's Creek or the county line.

The oval body to the south of Vincent extends southward to the river and is several miles wide. It is made up principally of limestones, except along around its edges. Its limestones are not thin bedded like most of those of this formation. They are principally blue, some of them being so dark as to be almost black, though some of them are gray. They carry some calcite streaks and usually appear to be quite pure, though some of them have argillaceous streaks and splotches and some few of them a little chert in nodules. Some of them on the weathered outcrops are smooth while others are in furrows and ridges. They make a poorly drained flat-woods with dry lime sink and with a stiff clayey soil that during the winter months or wet seasons is very soft and sticky. Their growth is mostly oak with some red cedar and short leaf pine.

The edges of this oval body is principally of dark and black shales. These shales are cut up by vertical joints and in many places are fissile and tough enough to be classed as roofing slates.

The narrow strip just to the south-east of the belt of [c] Montevallo [Variegated] Shales and Sandstones in the Cahaba Valley are of the usual*shales with thin bedded blue limestones.

The patches along Beeswax Creek, so far as have been seen, are of a dark and blackish blue fissile limestone with calcite streaks that is hard enough to have a metallic ring when struck with a hammer. It occurs both to the north-west and south-east of the synclinal of the Columbiana Mountain. Prof. Tuomy places this limestone under the conglomerate of the Columbiana Mountain or the [b] Weisner [Chilhowee] Sandstones and Conglomerates. It is rather believed to be over the rocks or of that formation and separated from the above sandstones and conglomerates by faults. The following analyses have been made of it:

	1	2	3
Carbonate of Lime	90.52	90.43	89.03
Carbonate of Magnesia	4.93	4.28	3.91
Ferric Oxide and Alumina	0.49	0.74	1.08
Silica	4.35	4.30	4.88
Phosphoric Acid		trace	0.00
Iron Pyrites			0.26
Carbonaceous Matter	trace	trace	
Water			0.64

(1) and (2) from Prof. Tuomy's Second Biennial Report. Labled:—Analyses of Limestone from Beeswax Creek.

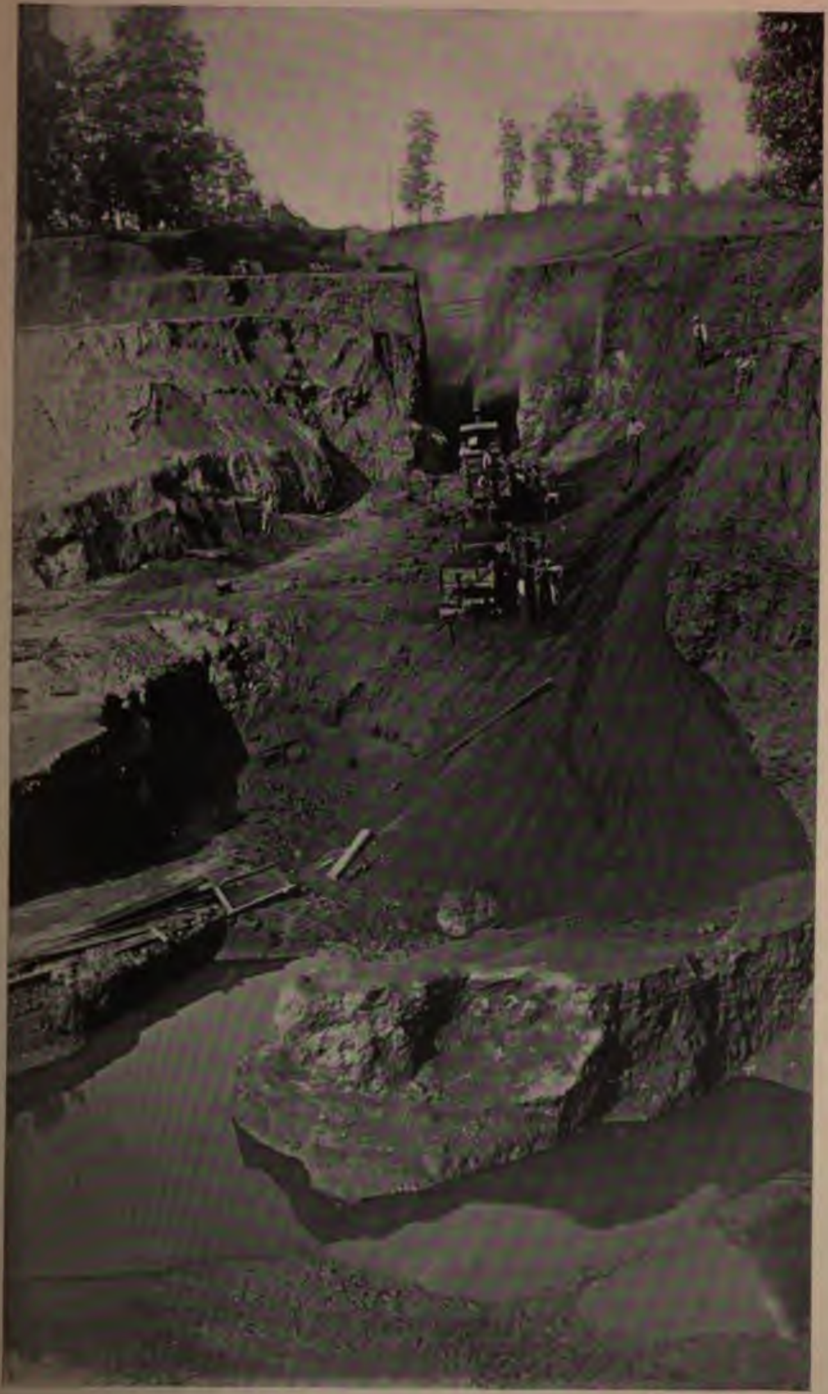
(3) From State Geologist Report for 1876. Labeled:—Limestone from Quarry on S. R. & D. R. R., near Columbiana.

These analyses show this limestone to be much purer than it looks to be, and of most remarkable uniformity of composition.

The patch of this formation along the Valley Road near Kelly's Creek is of the black fissile shales.

(3) *Lower Silurian.* This group, from 3500 to 5000 feet thick, covers about 200 square miles of the surface area of Shelby County. It may be said to be of two irregular belts, one in the Cahaba Valley and the other along the Coosa River. It is made up of (f) *Pelham* (*Trenton*) *Limestones* and (e) *Siliceous* (*Knox*) *Dolomite and Chert.*

(e) *Siliceous* (*Knox*) *Dolomite and Chert.* This formation, from 2500 to 3500 feet thick, forms about 60 square miles of the belt in the Cahaba Valley and about 80 square miles of the one along the Coosa River. Both of these belts have along their edges the characteristic big springs of the formation. The Cahaba Valley belt is of double width or is duplicated for several miles west of Longview. Opposite this duplication, it is in contact on the west, along a fault, with Coal Measures. Its lower strata for several miles to the north-east of Montevallo are bent over towards the south-east until they have a north-west dip on the outcrop. Over these lower strata



SHELBY LIMONITE BANKS, SHELBY, ALABAMA.

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ASTOR, LENOX
TILDEN FOUNDATIONS

red loam near the Montevallo Depot, there are nsive limonite diggings. The ore is gravelly es to be washed. Other limonite deposits are ur near Longview or in the S. W. ¼ of S. W. ¼ . 21, R. 2 W., and west of Siluria and to the of Helena. The following analyses of these om the State Geologist Report for 1876:

	1	2	3
ity	*3.31*	*3.61*	
de	84.10	73.44	84.03
	11.19	13.49	1.50
c Acid	0.20	0.33	1.22
	0.27	1.03	0.20
Manganese	trace	0.00	0.20
	1.02	0.38	0.24
	0.08	0.08	trace
	0.46	0.28	0.03
	11.19	11.27	11.98

ely fibrous limonite; outer surface smooth, mamelon-eddish color: interior rough, more or less porous and lby County, six or eight miles north-east of Monte-

et limonite, breaking with smooth conchoidal fracture; [illegible]; color of ore, light liver brown; of powder, yellow. [illegible] eight miles north-east of Montevallo.

[illegible] limonite from five miles north-east of Helena.

cherty ridge of this belt to the north-east of known as *New Hope Mountain*.

along the Coosa River is very irregular in its is of badly faulted, crumpled, and broken It is cut in two by a point of newer forma-ing south east to the river at and below the Yellow Leaf Creek. This belt is principally strata of the formation and so it does not ratively speaking, much of the cherty strata. These lower strata appear to become shaly towards the south-west. They are believed to form the low rolling, knobby, piney woods country of sandy mulatto loam, with some spots of red sandy loam, to the east of Shelby. This piney woods country must be for the most part underlaid by limestones or shales, as the only visible rocks in it are of small pieces of chert and an occasional patch of gravelly limonite.

The *Shelby limonite banks* along the western edge of the above piney woods country are believed to overlie the bottom strata of this formation just east of a big fault. These banks are in red and straw colored loams with *horses* or pockets of white and bluish clays and with in places in the red loam some few yellowish flakes of a sandy shale and a chalky chert. This deposit is a very extensive one. It is of a high broken hill of perhaps 160 acres though, of course, the ore banks do not cover all of this area. These banks have furnished the ore for one furnace for about 50 years and for a second furnace for about 20 years. The deepest digging in 1890 had reached a depth of about 75 feet and there was still ore in its floor. Plate XVII and Plate XXX are of photographs of portions of these banks. The ore, as a general thing, is of good quality. It is in boulders, nodules, and pebbles, and is of the needle, botryoidal, stalactitic, spongy, and pot ore varieties. One of its boulders is said to have weighed over 62 tons. In some of the banks, however, there are layers that carry considerable sandy ore. These layers appear to have some stratification or to have a dip of 30 deg. to 40 deg. to the south-east. The following analyses are of ores from these banks:

	1	2	3	4
Ferric Oxide	78.86	81.35	82.82	72.620
Silica	7.06	11.74	0.29	7.815
Phosphoric Acid	0.37	0.11	0.15	0.527
Alumina	2.37	1.59	0.35	
Manganese Oxide	1.49	0.75	0.77	
Lime	0.58	0.57	trace	
Magnesia	trace	0.12		
Sulphur	0.14	0.16		
Water	9.25	3.80	14.62	

(1) From Report of State Geologist for 1876 Labeled:—Analysis of ore from the banks of the Shelby Iron Company. Analyst:—Prof. C. F. Chandler.

(2) From Report of State Geologist for 1876. Labeled:—Roasted Ore from banks of Shelby Iron Company. Analyst:—Prof. C. F. Chandler.

(3) From Prof. Tuomy's Second Biennial Report: "A pure brown hematite of radiating, fibrous structure; the exterior surface of the botryoidal mass smooth and glazed Sp. Gr. = 3.626. Locality:—McClanahan,s Furnace, Shelby County.

(4) Principally a compact liver colored ore. A good average sample from the banks of the Shelby Iron Company, dried at 100 deg. C.

Along the south-east edge of the piney woods country to the east of Shelby, there are irregular knolls and ridges of the cherty strata of this formation. Some of these knolls and ridges near the county line are covered on their north-west sides with well rounded flint pebbles, these rounded pebble are mostly of large size and many of them are flesh colored. The chert is often ferruginous and is sometimes enough so to be termed a limonite. The *Tower Hill* is a high knoll of the cherty strata in the N. W. ¼ of N. W. ¼ of S. 17, T. 22, R. 1 E. At its north-west foot, there is an outcropping of dolomite with a dip of about 30 deg. to the south-east. To the ENE. of this hill or in the S. E. ¼ of S. 8, T. 22, R. 1 E., there are some limonite diggings.

Limonite deposits, of mostly gravelly ore in a deep red loam, have been seen in several places to the north-east in this southern part of the belt. The dolomites make a fine showing around a big spring in a low flat country about ½ mile south-east of Wilsonville.

To the south-east of this southern part of the belt, with a synclinal of (h) Oxmoor Shales and Sandstones and (f) Pelham (Trenton) Limestones between, there is a narrow ridge or anticlinal of the upper or cherty strata of the formation. This ridge extends from the crossing of the river just above the mouth of Cedar Creek or Old Ft. William's Ferry to the south-west to the county line, though it is not altogether in Shelby County, as it crosses and recrosses a couple of times the winding river. This anticlinal or ridge at its south-west end, at least, is just to the south-east of a fault. Some of its chert is blue and flinty and some of it is sandy. It has also over its surface, especially over its north-west side, in places, some of the rounded flint pebbles.

The north-east portion of this belt includes or surrounds the Cambrain strata of the oval-shape body of Flatwoods to the south of Vincent and of the patch along the Valley Road near the crossing of Kelly's Creek, the county line. It is bounded on the north-west by a fault that brings its bottom strata in contact with (h) Oxmoor Shales and Sandstones and (f) Pelham (Trenton) Limestones. It is for the most part a comparatively flat rolling and knobby piney woods country of orange and yellow sandy loams with some spots of red sandy loam. In its loams, there are some chalky cherty shales and some small pieces of spongy halloysite. It is underlaid by dolomites and limestones and has the characteristic lime sinks of this formation. It has however in its northern part the south-west end of a cherty ridge that surrounds, except on the north-west side, the patch of Cambrian strata that show along the Valley Road near Kelly's Creek, the county line. This ridge must occupy a synclinal between the anticlinals on which occur the exposed Cambrian strata. The strata to the north-west of it, along the edge of the belt or the bounding fault, are badly broken up. In them, for 75 to 80 yards on a spur of a high cherty mountain or ridge, in the S. E ¼ of S. 23, T. 18, R. 2 E., there is a considerable deposit of limonite in boulders and nodules. This ore is mostly smoothly weathered. Some of it is sandy and some of it is black and waxy, and is high in phosphorus. An average sample of this ore, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	69.929
Silica	15.780
Phosphoric Acid	2.143

Analyst, J. L. Beeson.

(f) *Pelham (Trenton) Limestones.*—This formation, from 1000 to 1800 feet thick, covers some 35 square miles of the belt of Lower Silurian strata in the Cahaba Valley and nearly 15 square miles of the one along the Coosa River. Its strata are highly developed in the Cahaba Valley. They form a belt that is continuous through the county and that at Longview is over 2 miles broad. This belt at its south-west end is separated by a fault and the underlying formation from its proper continuation, a considerable body of these rocks around and to the south-west of Calera, over the top of an anticlinal. The limestones of this belt have been extensively quarried and burnt into lime in the neighborhood of Calera, Longview, and Siluria. They have furnished the major part of the lime that has been made in the State. This lime has an excellent reputation. These limestones are of very uniform composition and are very pure. They have, as stated by the State Geologist in his report for 1876, between 95 and 99 per cent. of carbonate of lime. The following analyses, taken from the report for 1876, of limestones from near Longview will serve to show the composition of all those in this belt that are used for lime making:

	(1)	(2)	(3)
Specific Gravity	2.81	2.75	. .
Carbonate of Lime	99.11	99.16	97.52
Carbonate of Magnesia	0.75	0.75	1.27
Silica	0.39	0.15	0.78
Iron and Alumina	0.13	trace.	0.35

(1) Compact drab colored limestone, showing occasional crystalline faces; breaking with splintery fracture. Used in Reynolds' kiln at Longview.

(2) Very fine grain to compact. From same locality as (1).

(3) Limestones from Mr. Jones', S. 28, T. 21, R. 2 W., on S. & N. R. R. near Longview.

Many of these limestones on their outcrops are weathered into furrows and ridges and often form glady places with a growth of red cedar. The upper strata are black fissile argillaceous calcareous rocks that in places are said to make a very good hydraulic cement.

The limestones just south of Calera have associated with them, as stated in the report for 1876, a small bed of limonite that is intimately mixed with *barite, heavy spar*. The black fissile argillaceous strata at the top of the formation in an outcropping near Siluria have been burnt and tested as a cement rock, with very good results, so stated, when properly treated. The lower strata of this formation in their outcrops near Pelham

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TILDEN FOUNDATIONS

are in naked ledges that are covered with a growth of red cedar. These ledges, running with the strike of the rocks, form a country that is very bad to cross with a wagon along an ungraded country road.

This formation in the belt of Lower Silurian strata along the Coosa River is in many narrow strips. In the south-west portion of this belt, it is of strips or outcrops on two sides of a broken and faulted synclinal of [h] Oxmoor Shales and Sandstones. The strip or outcrops on the north-west side of this synclinal start in near Mardis' Ferry on the north-east and extend to the south-west until they gradually die out or become engulfed in a fault about south-east of Shelby. This strip itself at its north-east end or to the north-east of the mouth of Beeswax Creek is of a narrow shallow synclinal with some overlying (h) Oxmoor Shales and Sandstones. To the south-west, it is for the most part a flat valley. In it near Kewah-atchie Spring or in the S. E. ¼ of S. 16, T. 22, R. 2 E., is the quarry which has furnished the flux for the Shelby Furnaces since the first one was built some 50 years ago. This quarry has the objection of being in a comparatively low valley or in strata with a loam covering and below drainage level. The accompanying Plate XXXI is of a photograph of it. Its principal rock is a blue limestone with calcite streaks. The following analyses, taken from the State Geologist Report for 1896, and analysis (2) at the end of this chapter from Maj. Fitzhugh's Report, are of samples from this quarry:

	(1)	(2)	(3)	(4)	(5)
Carbonate of Lime	96.70	93.77	98.91	67.55	95.40
Carbonate of Magnesia	....	2 48	0.58	24.91	0.94
Silica	2.50	2.09	1 08	3.46	2.25
[illegible] and Alumina	1.40	1.01	0.63	3.58	0.68
Phosphoric Acid	....	0.00	0.00	0.07	trace.
[illegible] Pyrites	....	0.29	0.10	....	....
[illegible]	....	0.23	....	0.45	0.73
Sulphur	....	....	....	0.02	trace.

[illegible] made by Prof. W. C. Stubbs and the others by J. B. [illegible] of a light colored, granular seam, and (5) is of a [illegible] compact seam.

The strip or outcrops on the south-east side of the [illegible] faulted synclinal of (h) Oxmoor Shales and [illegible]stones cross the river just above the mouth of [illegible] Creek and extends to the south-west as a narrow [illegible] valley until it gradually becomes engulfed in [illegible] in S. 6, T. 24, R. 16 E. To the south-east of [illegible] narrow strip or valley, there is a narrow ridge of [illegible] of [e] Siliceous [Knox] Dolomite and Chert [illegible] wider strip or valley of these limestones [illegible] Coosa River. This valley extends to the [illegible] west to beyond the county line, though it is only [illegible] Shelby County, as it crosses and recrosses the [illegible] river, the county line, a couple of times.

[illegible] formation in the north-east part of the broad ir- [illegible] of Lower Silurian rocks along the Coosa [illegible] repeated narrow strips along the south-east [illegible] broken faulted country of [h] Oxmoor Shales [illegible] Sandstones. These narrow strips are separated [illegible] each other by ridges of Sub-carboniferous strata [illegible]. They are of two belts or are cut out for [illegible] miles by an extension to the south-east, along a [illegible] broken country of [h] Oxmoor Shales and [illegible]stones to the north-west. The smaller or south- [illegible] these belts has three distinct strips of this forma- [illegible] The most north-west of these strips extends only [illegible] northward from its southern end, the [illegible] while the most eastern one is some 5 miles long.

he larger or northern of these two belts of narrow rips sets in about west of Harpersville and extends to e north-east to beyond the county line. It has 5 disnct narrow strips of this formation at its southern end, hile it has only two of these strips at its northern end. he outcrops of these strips in many places form high uffs, especially near their north-east and south-west nds. Over the lower strata of the most south-east rip, in the S. W. ¼ of N. E. ¼ of S. 30, T. 19, R. 2 E., ere are several knolls with outcrops of *barite*, *heavy ar.*

Upper Silurian (*Red Mountain or Clinton*) and *Devon-n* [*Black Shale*] strata may occur in Shelby county, ut they have not been recognized and are known o be wanting in a great many places in the county.

[*4*] *Lower Sub-carboniferous*, [*g*] *Fort Payne Chert.* This formation, from 0 to 150 feet thick, covers between 15 and 20 square miles of Shelby county. It forms a ridge along the south-east edge of the Cahaba Valley that extends through the county from north-east to south-west. This ridge however has a couple of gaps in t, one to the north-east of Longview and the other a ouple of miles to the north-east of Pelham, at each of which it is duplicated for a mile or more. This ridge n the continuation from its south-west end near the ounty line around the head of the Calera anticlinal is ngulfed in a fault for several miles.

It carries in its lower strata in places regular stratiied limonite. This ore however is usually siliceous. , in an outcropping in the N. W. ¼ of S. 3, T. 22, . 2 W., is of a seam about 18 inches thick. It here ies scattered over the surface in large loose boulders. Where cut through by the railroad in the southern part f S. 7, T. 21, R. 2 W., it is nothing more than a ferruginous chert. The cherty ledges at the bottom of the formation are here exposed to a thickness of some 45 feet. The ore in its outcropping on the south-east ridge of the duplication to the north-east of Pelham or in S. E. ¼ of S. 6, T. 20, R. 2 W., has been dug some and hauled to Helena, so said, and used in the puddling furnaces. See limonite under extracts from Maj. Fitzhugh's Report at the end of this chapter.

The ore, a black waxy ore, high in both iron and phosphorus, occurs loose with chert over the sloping east side of the ridge around the north-east end of the Calera anticlinal or in the southern part of S. 15 and the northern part of S. 22, T. 22, R. 2 W.

This formation to the south-east of the Coosa Coal Field or along the Coosa River gradually dies out towards the south. It does not extend south of the line between T's 20 & 21 S. It forms sharp crested ridges between the repeated narrow strips of (f) Pelham (Trenton) Limestones along the south-east edge of the broad broken faulted country of (h) Oxmoor Shales and Sandstones. Its limonite on the south-east side of one of these ridges in the N. E. ¼ of S. E. ¼ of S. 22, T. 18, R. 2 E., is of two seams with outcrops from 25 to 30 yards apart. The upper of these seams is from 18 inches to 2 feet thick. Its outcrop can be followed by the loose blocks of ore over the surface. It is for the most part a spongy liver colored ore, though some of it is compact and some of it is black and waxy. It is very high in phosphorus, as shown by the following analysis of a good average sample of it, dried at 100 deg. C :

Ferric Oxide	66.773
Silica	17.436
Phosphoric Acid	2.676

Analyst:—J. L. Beeson.

The lower seam does not carry so much iron and appears to be only a few inches thick.

This formation forms also a ridge on both the north-west and south-east sides of a narrow anticlinal to the south-west of Lewis P. O. On the south-east of these ridges, on its south-east side, in the S. W. ¼ of N. W ¼ of S. 20, T. 20, R. 1 E., there is a test pit with the following section:

Section of Test Pit in S. W. ¼ of N. W. ¼ of S. 20, T. 20, R. 1 E.

(5) Loam; golden colored	
(4) *Limonite*. Loam; principally limonite	3 ft.
(3) Loam. Chert. *Limonite*; from	5 to 6 ft.
(2) *Limonite*, Loam; mixed.	1 ft. 6 in,
(1) Loam: red and mulatto colored.	

This ore is of very light weight and has considerable yellow ochre sticking to it. It is high enough in phosphoric acid to be termed a phosphate, as shown by the following analysis of a good average sample of it, dried at 100 deg. C:

Ferric Oxide	62.000
Silica	12.734
Phosphoric Acid	3.763

There is an under seam of limonite here that crops out on the north-west side of the ridge, near its top. Its ore however, so far as seen, is cherty.

(5) *Upper Sub-carboniferous*, (h) *Oxmoor Shales and Sandstones*. This formation, from 1200 to 1800 feet thick, covers nearly 250 square miles of the surface area of

the north-west of the Coosa
valley along the south-east
and to the south-east of the
expanse of a broken faulted
extends to beyond the country
south-west. It also forms a
valley between the two parts
and a broken faulted irregular
River in the south-east corner
made up of shales, principally
interstratified hard bluish flinty
in places, some siliceous lime-
carry irregular splotches and
tz. Its shales have also concre-
distones, and, in places, black or
ous balls with specks of iron
es, mostly thin bedded, have often
s crust over the weathered surfaces
; and its limestones, of blue and
streaks.

of country to the south-east of the
a maximum width of some 9 miles
of over 7 miles. Its strata [illegible]
steep south-east dip or are about [illegible]
believed to be less than 1500 feet
crumpled up and faulted. A [illegible]
outline of this country on the
most part on the north-west. [illegible]
art, was at one time covered with
[illegible] pine that has now in many
[illegible] and converted into charcoal
[illegible] however, principally along
[illegible] hard timber, as poplar, [illegible]
[illegible] sometimes, [illegible]

uite distinctly limestones or calcareous outcrop-
. Outcroppings of the limestones can be seen at
Calera, near Shelby Springs and Columbiana,
Four Mile Creek, and in several places along Yel-
eaf Creek. The black slaty shale has in several
s been dug into for stone coal. On a ridge of shales
ndstones to the east of Calera or in the S. E. ¼ of
¼ of S. 2, T. 24, R. 13 E., there is an outcrop of a
ar stratified ledge of sandy limonite that in the
ered specimens is spongy or honey-comb.

e Shelby Springs, consisting of two sulphur springs
white deposits, a chalybeate spring, and the "*mag-*
spring," are on the south-east edge of this broken
ry, in a narrow valley, along the boundary fault,
les with interstratified thin sandstones and lime-
s. A large limestone spring occurs in a low flat
hy place in the N. E. ¼ of S. E. ¼ of S. 14, T. 21,
W. Near this spring, there are outcrops of fossilif-
blue and gray limestones with irregular streaks
plotches of calcite and quartz. Some of these lime-
s are banded or are made up of interstratified seams
pure blue limestone with smooth weathered sur-
and of an impure or siliceous limestone that on the
hered surfaces is rough or raspy and of a dirty dull
wish color.

ar the north-west edge of this broken country or in
. E. ¼ of N. E. ¼ of S. 21, T. 20, R. 1 W., there is
ll of ferruginous concretionary boulders filled with
ent colored sands.

e largest patches of limestones are along Yellow
Creek in S's 4 and 14, T. 20, R. 1 E. The latter of
patches is said to cover between 600 and 700 acres.
e patches are marked out with great distinctness by
wth of hard timber in forests of long leaf pine. In

the piny woods on Dry Creek in the. S. W. ¼ of S. 5, T. 20, R. 1 E., the black carbonaceous shale has been dug into for stone coal. It was also sunk down on for coal about one mile north of Calera.

The bottom strata of the formation frequently form a part of the narrow valley between the repeated ridges of (g) Fort Payne Chert along the south-east edge of this broken country.

This formation in the narrow valley that separates the two parts of the Coosa Coal Field is almost completely engulfed, for several miles opposite the *big narrows*, by the fault along its north-west edge.

The valley of this formation to the north-west of the Coosa Coal Field, along the south-east edge of the Cahaba Valley, is a broken piney woods country of irregular hills and ridges.

The irregular broken and faulted synclinal of this formation along the Coosa River in the south-east corner of the county is not entirely within Shelby County. Its strata immedately overlie (f) Pelham (Trenton) Limestones, the intermediate (g) Fort Payne Chert being here entirely wanting. This synclinal is for the most part a knobby broken country that was originally almost completely covered with the long leaf pine. Nearly all of its growth has however been cut off and converted into charcoal, and it is now, for the most part, a barren naked waste with but few settlements. It has however some spots of fertile calcareous red loam that are in cultivation. Over the poor knobby country, there are loose fragments of flaggy sandstones with surfaces set with quartz crystals. These crystals are especially large and numerous over the lower sandstones of the formation. They are in places called "diamond rocks." In the bottom strata on the south-east side of the synclinal where crossed by the Wood's Ferry Road or in the S. E. ¼ of S. E. ¼ of S. 12, T. 24, R. 15 E., there is an outcropping of a regularly stratified ledge, from 8 to 10 inches thick, of very good limonite that is partly manganiferous. On the opposite or north-west side of the synclinal, there is in the lower strata of this formation a coarse massive flaggy sandstone that is in places a conglomerate with a few well rounded flint pebbles of the size of bird shot. The weathered surfaces of these sandstones are literally covered with quartz crystals that glisten in the sunlight, hence the name "diamond rock". This sandstone or conglomerate in places is very hard and would doubtless make a very good millstone. Just over this rock, there crops out in Mr. T. B. Lovett's yard, in the S. W. ¼ of N. E. ¼ of S. 2, T. 24, R. 15 E., a dull grayish impure limestone that on the weathered outcrops is more or less shaly. This limestone is so full of *brachiopods*, small *crinoids*, and other fossils, as to be called a *marl*. Its outcrop at Owen's Mill on Spring Creek in the western part of fractional S. 22, T 22, R. 1 E. is of dark bluish and dull grayish colors. The calcareous sandstones in places are also fossiliferous.

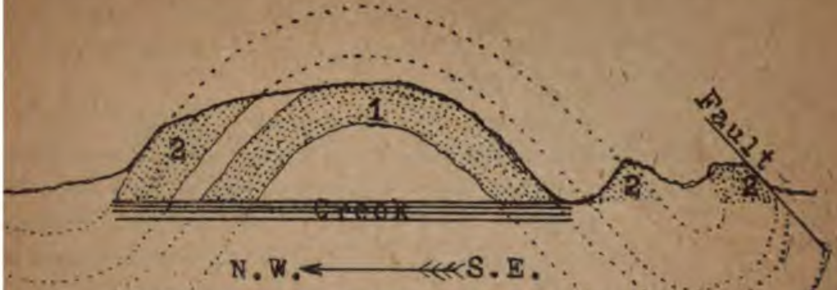
This synclinal at its north-east end, where cut through by the Coosa River beteen old Fort Williams and Mardis ferries, has some massive sandstones that form high bluffs on both sides of the river. One of the prominent bluffs on the west side of the river is called the "Ivey Bluff". The extreme north-east end of this synclinal west of the river or in Shelby county, the tongue or point to the north-east of Beeswax Creek, can be plainly seen to be of the trough of a shallow synclinal with [f] Pelham [Trenton] Limestones cropping out on three sides of it.

[6] *Carboniferous*, [*i*] *Coal measures*. This formation, with a maximum thickness of over 5000 feet, em-

braces about 240 square miles of the surface area of Shelby county. Of this area about 130 square miles are of the Cahaba Coal Field and the balance, 110 square miles, is of the Coosa Coal Field.

The portion within the Cahaba Coal Field includes the thickest measures of that field. It, according to Mr. Jos. Squire's Report on the Cahaba coal Field, has a maximum thickness of over 5,000 feet of coal Measures with some 49 seams of coal. These 49 coal seams have an average combined thickness of near 100 feet of coal; 19 having an average of 2 feet and over each in thickness of coal, 11 having an average of 3 feet and over each in thickness of coal, and 3 having an average of 5 feet and over each in thickness of coal. These coals, as a general thing, have a bright shiny luster and are quite pure, hard, and dry. The reader is referred to Mr. Squire's report for a detail description of these Coal Measures. They had a coal output for 1896, according to the State Mine Inspector, of 52,923 tons.

The portion of the Coosa Coal Field within Shelby county includes all of the cut off south-east part of the field, of about 50 square miles in area, and the south-west end or about 60 square miles of the north-west or main part of the field. Both of these parts are bounded on the north-west and around their south-west ends and partly on the south-east by high rims and bluffs of the massive conglomerates near the base of the Coal Measures. They are partly bounded on the south-east by faults. The accompanying sketch, Fig. 11, shows these hard massive conglomerates in a fold and also the fault along the south-east edge of the north-west or main part of the Coosa Coal Field.



ANTICLINAL at BRAZIER'S MILL
in S.W. 1/4 of N.E. 1/4 of S. 20, T. 19, R. 1 W.

Horizontal and Vertical Scale:-
1/4 1/2 Mile.

(1) Lower Conglomerate (of Tennessee). (2) Upper Conglomerate (of Tennessee), denuded over the top of the arch.

The portion of the north-west or main part of this field embraces what Gen. Gibson, in his report on the Coosa Coal Field, terms the Howard Basin and Pea Vine Creek Section. He says that the Howard Basin has an area of about 20 square miles and that it carries several different seams of coal, the thickest of which is about 32 inches thick. To the Pea Vine Creek Section he also gives an area of about 20 square miles and several seams of coal. The thickest of these coal seams, the Cunningham Seam, he puts at 5 feet 6 inches thick of solid compact coal.

The cut off south-east part of the Coosa Coal Field is discribed by Mr. Gibson under the head of the Yellow Leaf Basin. He gives to it an enormous thickness of over 6,000 feet of Coal Measures, the thickest in Alabama. We think that this thickness is entirely too great, notwithstanding that it is seemingly correct. We believe the strata to be repeated by folds and faults.

Mr. Gibson speaks of their being many coal seames in this basin, the principal of which are the seam 4 feet thick in the Johnson Bottom and the Martin Seam, 12 feet 10 inches thick.

(7) *Cretaceous*, (j) *Tuscaloosa*. This formation doubtless occurs in the south-west corner of the county though it has not been recognized within this county.

(8) *Tertiary*, (k) *Lafayette*. This formation includes most of the superficial covering of red loams, sands and rounded pebbles in the south-west corner of the county.

EXTRACTS FROM REPORT BY COL. G. D. FITZHUGH, C. & E. E., L. & N. R. R. CO., ON THE REGION ALONG THE ANNISTON AND ATLANTIC RAILROAD IN SHELBY COUNTY.

Limonite or Brown Iron Ores.—In the N. E. ¼ of S. 28, T. 21 S., R. 2 W., there is a deposit of brown ore running with Oak Ridge......Several test-pits have been dug, exposing the ore to a depth of 4 feet. The ore extends with the ridge for six miles and is seen in great abundance where Camp Branch cuts through the ridge in S. 2, T. 22, S. R. 2 W., from which point several tons were taken to the Central Iron Works at Helena for experimental purposes and found to be not as good in quality as would be expected. The following analysis of it is by A. F. Brainerd:

Metallic Iron	43.956
Silica	11.750
Maganese	1.000
Alumina	7.756
Lime	0.522
Sulphur	0.013
Phosphorus	1.081
Water	13.694

In the N. E. ¼ of S. 28, T. 21 S., R. 2 W., on the east side of Oak Ridge, there is an extensive bed of *siderite* extending along the ridge for three miles. ......The thickness of the bed, as seen in an old test-pit, is nearly 4 feet.

In the N. E. ¼ of S. 9, there is an extensive deposit of brown ore. The beds are located in a high ridge on the south side of the valley formed by the prong of Waxahatchee Creek that makes Hudson's Gap, in Oak Ridge, and are equally divided in quantity between wash and lump ore.

In S's 25 and 26 there are deposits or beds of brown ore that show well on the surface. Several test-pits have been dug to a depth of 5 feet into the ore, not giving, however, the true thickness of the beds which appear to be fully 15 feet thick as seen in the gullies in the sides of the ridges.

In S. 9, T. 24 N., R. 14 E., about 5 miles south-east from Calera, there is a deposit of fibrous brown hematite. The surface indications show a large deposit of ore, but no ore is seen in the gullies washed in the sides of the hills capped with ore, nor is there any ore showing in the sides of an old well dug in the deposit. From all indications, the deposit is a ''mere scab.''

Near the southern part of T. 22 S., R. 1 E., about 2 miles west of the Coosa River, there is a large and valuable deposit of brown ore belonging to the Shelby Iron Company. The quantity of ore is equally divided between lump and wash ore. In S. 12, same township, there is also a large deposit of brown ore. The wash ore of this bed seems to predominate. The ore of both of these beds lies well for cheap mining, an ample supply of water for washing it can be had from either the Coosa River or Spring Creek.

[illegible] outcrop 75 feet above drainage level in S

[illegible] W. Analyst:—A. F. Brainerd.

[illegible] Company Quarry about 4 miles east of Shel

[illegible] the Shelby Iron Company.

CHAPTER XII.

TALLADEGA COUNTY.

The geological formations exposed to this county are as follows:

(6) *Upper Sub-carboniferous.*	(i) *Oxmoor Shales and Sandstones*	1000–1500 feet
(5) *Lower Sub-carboniferous.*	(h) *Fort Payne Chert*	0–50 feet
(4) *Upper Silurian*	(g) *Red Mountain (Clinton)*	0–10 feet
(3) *Lower Silurian*	(f) *Pelham (Trenton) Limestones*	800–1200 feet
	(e) *Siliceous (Knox) Dolomite and Chert*	3000–4000 feet
(2) *Cambrian*	(b) *Coosa (Flatwood) Shales and Limestones*	300–500 feet
	(c) *Montevallo (Variegated) Shales and Sandstones and Aldrich (Beaver) Limestones.*	2000–3000 feet
	(b) *Weisner (Chilhowee) Sandstones*	2000+feet
(1) *Crystalline*	(a) *Talladega (Ocoee) Slates, Conglomerates, etc.*	

(1) *Crystalline*, (a) *Talladega (Ocoee) Slates, Conglomerates, etc.*—This formation in Talladega county forms a belt of very broken mountainous country from 4 to 6 miles broad that extends through the county from north-east to south-west. It is between a great overthrust fault on the north-west and the south-east county line or the tops of the Talladega and Rebecca Mountains on the south-east. It thus embraces nearly ⅕ or some 135

square miles of the surface area of the county. The strata are well exposed along Talladega Creek, hence the local State name given to them. The strata in a general way appear to become more and more metamorphosed towards the south-east and also towards the south-west. This broken country is made up of a succession of broken ridges, parallel to the Talladega and Rebecca Mountains on the southeast, of hydromica or talcose slates with interstratified sandstones and conglomerates. The shales, as a general thing, in mass have a greenish tinge, though as loose scales they have a silver and pearly white appearance. The following analysis of a sample of them from Taylor's Mill (Cragsdale) on Talladega Creek is taken from the State Geologist's Report for 1894:

Combined Water	2.26
Siliceous Matter	57.59
Protoxide and Sesquoxide of Iron	8.81
Alumina	14.87
Lime	1.54
Magnesia	6.33

It is stated in the above report that the alkalies were not determined and that all of the above percentages, except those of the water and siliceous matter, are somewhat too low on account of an accident. The strata at the mill are badly crumpled, though they have a general south-east dip. The sandstones and conglomerates, in a general way, become more and more quartzitic towards the south-east and south-west. The shales in places carry interstratified seams or layers of quartz. The weathering of the shales leaves this quartz scattered over the surface in loose nodules and pebbles. Some of these nodules and pebbles have a fibrous structure and some of them have slaty steaks. This quartz is sometimes auriferous. It has been worked in several places, as at the Cunningham Gold Mine in the S. W. ¼ of S. W. ¼ of S. 17, T. 19, R. 6 E., and the Annie Howe Gold Mine on a branch near Riddle's Mill, and in several other places along Talladega Creek in a small way with the pick, shovel, and pan. It is in places very rich in gold but it is expensive to mine because of its thinness and of the hardness and toughness of the imbedding shales. See Dr. Wm. Taylor's article on gold mining in Talladega county, at the end of this chapter.

The State Geologist in his report for 1874 says that the hydro-mica slates or the smooth greenish slates along Talladega Creek above Riddle's Mill in S. 16, T. 19, R. 6 E., become more and more siliceous as you go up the creek and finally pass into a conglomerate, which with many alternations with softer yellowish buff colored and greenish talcoid slates make up the country as far as the upper falls of the creek. The following description of the rocks and country along Talladega Creek is taken from his report for 1874:

"This conglomerate, which is sometimes a slaty arenaceous rock, but oftener quite massive, is made up of the lumps or pebbles of opalescent quartz and opaque white feldspar held in a matrix of greenish talcoid matter. Where the greenish matrix prevails, the weathered masses of the conglomerate show a beautiful dark bluish green color. Other weathered masses of this conglomerate are lighter and more yellowish in color." He says that the bluish milky white opalescent quartz pebbles or grains are characteristic of these rocks. "All the bluffs and shoals of the creek above Riddle's Mill to the Upper Falls are caused by these heavy beds of conglomerate. Frequently large blocks of the rocks have been loosened from their places above by weathering and have rolled down the steep hillsides into the edges of the water, and in some instances, far into the creek, causing the water to make a detour. It is upon these immense blocks of conglomerate, (often larger than the ordinary log-cabins of the country), that the bluish green color is best seen. Upon a fresh fracture it is not so evident."

"The Upper Falls are formed by a heavy bedded quartzite which forms the crests of the highest ridges in this part of the Metamorphic Region."

"Below Riddle's Mill, I believe the conglomerate plays a very subordinate part; heavy beds of greenish soapy feeling smooth slates prevailing almost exclusively."

Talladega Creek as it crosses this formation has a great fall, and, as it always has plenty of water that is confined to a narrow channel with rocky bottoms and sides, it has many admirable sites for the erection of machinery. *Cragsdale* is on this creek as it leaves the broken country of Talladega Slates. All the creeks that cross these strata have a great fall.

This broken belt is a wild country that is still for the most part covered with its native growth of principally long leaf pine and black jack oaks, except near its north-east end or near Ironaton where its timber has been mostly cut of and converted into charcoal. In this north-east end of it, or in the E. ½ of S. 6, T. 19, R. 7 E., is the so-called "Seay Silver Mine." This mine was located by an old Indian tale and on it there has been expended, so said, a great deal of money. It is probably the same one at which, the State Geologist in his report for 1874 says, there is no sign of metal other than a very thin and irregular layer of specular iron.

Crystalline strata or marbles occur along just to the north-west of the broken country of Talladega Slates or just to the north-west of the great thrust fault that bounds the Talladega Slates on the north-west. These marbles are in a narrow valley that is continuous with the great fault through the county from north east to south-west with the exception of a few miles. The fault is usually along the south-east edge of this valley, though not always. The principal marble outcrops are immediately along the fault and hence are mostly along the south-east side of the valley under the underthrust Talladega Slates. The marbles are metamorphosed Cambrian limestones [Coose (Flatwood) Shales and Limestones] to the south-west of Sycamore and metamorphosed Silurian dolomites and limestones (Siliceous Knox Dolomite and Chert), with perhaps one or two exceptions, to the north-east of Sycamore. They will be spoken of in detail under the proper formations. They were once quarried and worked to a considerable extent but the quarries have all been abandoned for some years. They frequently take a beautiful polish, though many of the polished pieces show flaws or small cracks after weathering. This defect probably had something to do with the abandonment of the quarries. None of the quarries, however, have been extended far enough away from the outcrops to show the real character of the rocks or for the rocks not to have weather cracks. See Dr. Wm. Taylor's paper on the "Marble Industry of Talladega County," at the end of this chapter.

[2] *Cambrian*. This group, from 4500 to 5500 feet thick, covers over 125 square miles of the surface area of Talladega county. It is in irregular long narrow belts that for the most part are broken or made up of hills, ridges, and mountains. It is of the [d] *Coosa* [*Flatwood*] *Shales and Limestones* [c] *Montevallo* [*Variegated*]

Shales and Sandstones, and *Aldrich Limestones,* and [b] *Weisner [Chilhowee] Sandstones.*

[b] *Weisner [Chilhowee] Sandstones.* This formation, visible to a thickness of over 2000 feet, does not cover over 50 square miles of the surface area of Talladega county. It is confined to the outlying mountains, namely: Sulphur and Chalybeate Springs Mountains, Katala Mountains, Kahatchee Mountains, Andeluvia [Pope] Mountain, Weewoka Mountains, and Alpine and Talladega Mountains. These mountains are broad, broken, and elevated, and have many points that are from 500 to 1000 feet higher than the surrounding country. They are just to the south-east of faults, or are of the south-east halves of faulted anticlinals, and their high points are principally the crests of waves with north-west and south-east trends.

The *Sulphur and Chalbeate Springs Mountains* extend from down in Coosa county to the north-east, by the Talladega Sulphur Springs, on to Cedar Creek near Fayetteville, though the high point to the south-east and the one to the north-east of the Talladega Sulphur Springs are usually known as respectively the *Sulphur Spring Mountain* and the *Chaylbeate Spring Mountain.* These mountains,on their steep north-west sides,are of talcous slates with interstratified quartzites with a capping bluff of quartzite, though in places they are almost wholly of the talcous slates. The quartzites most often look like old weathered wooden chips with white or flinty streaks. Those of the capping bluff are principally of a dark bluish gray color, though some of them are reddish and others have a light yellowish color, with white quartz in nodules and irregular fragments. Some of its strata are fibrous and some are shaly or are a quartz schist. On top of the mountains there are hard thin flags or slaty pieces with a metallic ring and many loose nodules of the milky quartz. On the very highest point of the Sulphur Spring Mountain, there is a conical mound of loose rocks, such as is found on many of the high prominent points of the State. These mounds, made by a former race of people, doubtless covered human remains. This one, like most of the others, has been opened, either by the curious, the archæologist, or treasure hunter. The loose nodules of milky quartzites cover a rounded ridge that extends along the north-west foot of the mountain or along the fault from about opposite the Sulphur Spring on down into Coosa county. These nodules carry white quartz streaks and have a slightly fibrous and slaty structure or are more or less quartz-schists of white and gray colors. Some of them have a dull cherty look while others are sandy. The sandy ones show most plainly the schistose structure. They sometimes have flattened grains or small pebbles of translucent quartz that on exposure become more visible or of an opaque white color.

Near the foot of the mountain on the south-east side or in the S. E. ¼ of S. W. ¼ of S. 15, T. 22. R. 2 E., there is an outcrop of a hard ledge about 18 inches thick of a gray magnetic ore. It is of a dark gray color with shining quartz crystals on its weathered surfaces. Over this ore, there is a shaly gray sandstone for 3 to 4 feet to a sandstone ledge that in places is a poor shaly magnetic ore with streaks of quartz. See analysis of outcrop 1 at the end of this chapter.

The upper strata of these mountains, or those of especially the south-east side of the mountains, are most often of variegated shales and sandstones. These variegated shales, with interstratified quartzites, can be seen along the Anniston and Atlantic Railroad as it passes through a gap in the mountains in the N. W. ¼ of S. 10, T. 22, R. 2 E. In the upper strata of this formation, there are many outcrops of fissile shales or roofing slates. One of these outcrops along the foot of the mountain in the S. W. ¼ of N. E. ¼ of S. 3, T. 22, R. 2 E., has been quarried some and while its slate has a good cleavage and is comparatively free of joints it is seemingly too soft to be of any commercial value.

These mountains are duplicated at their north-east end or there is a short outlying mountain about ¼ mile to the south-east of them at their north-east end, on the south-bank of Cedar Creek, that is doubtless separated from them by a fault. On the sloping south-east side of this short mountain there are outcrops of a sandstone in thick flags that is used for building chimneys. These sandstones are leached to a yellow ochreous color, to a depth of some 2 inches. The unleached interior is calcareous and of a dark blue color. The line between the leached and unleached portions is sharp and distinct.

The *Katala Mountains* are between Cedar and Kahatchee creeks and to the west of the Fayetteville and Childersburg wagon rood. They, in a general way, are of two broken prongs that come together, near their north-east end, in an irregular high mountain. The eastern prong is much the longer, extending to the south to near Fayetteville. Its continuation to the south would include the short outlying mountain to the south-west of Fayetteville. These prongs are separated by a broken country of ½ mile or more in width at their southern end. This broken country is of strata at the top of the formation just to the north-west of a fault. These strata have in them outcrops of roofing slates. One of these roofing slate outcrops occurs along the publid road in the S. W. ¼ of S. W. ¼ of S. 22, T. 21 R. 2 E. and an other is said to be in the N. W. ¼ of N. E. ¼ of S. 22, T. 21, R. 2 E.

On the west side of the eastern prong of this mountain near its southern end or at the fork of the Mardis Ferry and McGowan Ferry roads, there are some loose pieces of a sandy magnetic gray ore. There is a reported outcropping of this same ore near the north-east end of the mountains or in the S. W. ¼ of S. 3, T. 21, R. 2 E., and of a black waxy limonite, doubtless high in both iron and phosphorus, in the W. ½ of S. W. ¼ of S 2, T. 21, R. 2 E.

The *Kahatchee Mountains* extend in a kind of crescent shape from near Chilersburg, by way of Oden's Mill, to near Sycamore. They are of a high main mountain along their inner or northern edge and of lower mountains, with cross spurs, that branch off from and form with the main mountain west of Oden's Mill a broad broken fan-shape mountainous country that is known as the *Kahatchee Hills*. The main mountains and ridges of this fan-shape country, like the ribs of a fan, therefore, in a general way, trend or point, commencing with the most southern ones, first towards the north-east, then towards the east, and lastly towards the south-east, towards the handle or stem of the fan-shape country. They are just to the south of faults. There are however in this broken country short cross ridges or spurs with different trends.

The most of this broken country, the Kahatchee Hills, in fact nearly all of it except usually the tops and steep northern sides of the principal mountains and ridges is made up of the upper strata of this formation, more or less metamophosed. The Kahatchee Hills are separated from the Katala Mountains by a broken faulted unsymmetrical synclinal valley of Aldrich (Beaver) Limestones or bottom strata of the overlying formation. On the eastern side of this synclinal or in the western edge of the Kahatchee Hills, in the S. E. ¼ of N. E. ¼ of S. 35 and S. E. ¼ of S. E. ¼ of S. 26, T. 21, R. 2 E., there is considerable limonite (McPherson's Bank) along with quartzites and conglomerates that resemble old weathered bones, and talcous shales with lenticular nodules of quartz. This ore, principally of the black waxy variety, is rocky or siliceous, the shining quartz crystals showing plainly in it. Some of it carries scales or flattened pebbles of milky quartz, and some of splotches of sand. Some of it however is liver colored and spongy and of good quality. A good average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	74.743
Silica	13.440
Phosphoric Acid	1.039

Analsyst:—J. L. Beeson.

See also analysis of deposit 6, Maj. Fitzhugh's report, at the end of this chapter.

This ore occurs also over the hill on the eastern edge of the synclinal in the western part of S. 12, T. 21, R. 2 E. It is here partly a good ore and partly a ferruginous quartzite of a yellowish ochreous color. It occurs also in the western part of S. 7, T. 21, R. 3 E. and the eastern part of S. 1, T. 21, R. 2 E. A small deposit of it on the end of a ridge or spur in the S. W. ¼ of S. W. ¼ of S. 31, T. 20, R. 3 E., of the *pot ore* variety, is of concentric rings with a fibrous texture. Higher up on the spur, it occurs as a shaly black waxy limonite sticking to conglomerate boulders. As a black waxy ore, mostly in rocky boulders, it occurs on both sides, and along the top of a ridge in the N. E. ¼ of S. W. ¼ of S. 32, T. 20, R. 3 E. Some of its bouldere have a high per centage of iron. This boulder ore is in pockets, though it is confined to the outcrops of certain stratified seams. It is sometimes fibrous and sometimes somewhat shaly. It is much better ore in places than in others. It is unusually good in an outcrop in the S. W. ¼ of S. W. ¼ of S. 32, T. 20, R. 3 E., where it is manganiferous. Its boulders frequently have streaks and cavities that are lined with a shell of a white frosty appearance, seemingly of siliceous matter though it may be bauxite (diaspore). They frequently have streaks and spots of quartzite with the appearance of old weathered bones, and scales or flattened pebbles of milky quartz. They, rocky or siliceous, occur on both sides of the ridge in the S. W. ¼ of N. E. ¼ and S. E. ¼ of N. W. ¼ of S. 32, T. 20, R. 3 E. An average sample of the limonite in S. 32, T. 20, R. 3 E., dried at 105 deg. to 110 deg. C., gave the following analysis:

Ferric Oxide	78.672
Silica	7.248
Phosphoric Acid	2.469

Analyst:—J. L. Beeson.

The Kahatchee Hills are connected with the Katala Mountains by a couple of low broken ridges or strips of similar strata that extend across the synclinal trough, dividing its limestones into two parts, and by a cross mountain that extends in a north-east direction from the northern end of the Katala Mountain to the northern end of the Kahatchee Mountains south of Childersburg. In the gap of this cross mountain through which the Kahatchee Creek and Fayetteville and Childersburg public road passes, there is the following outcropping:

Outcropping in the S. E. ¼ of N W. ¼ of S. 2, T. 21, R. 2 E.

[4] Slates; with some hard seams, visible about	5 ft
[3] Quartzite; gray, about	12 ft.
[2] Quartzite; very hard and compact, a dark gray with grains of *magnetite*, from	6 to 7 ft.
[1] Slate, Sandstone, Quartzite; a semi-talcous slate with interstratified seams of straw colored sandstones and gray quartzites, visible along the road for 60 yards, dip 35 deg. to south-east.	

This cross mountain to the north-east has quartzites, with white quartz streaks, that are in places conglomerates. At its north-east end, some 2 miles south of Childersburg, it is covered with loose quartzites, sandstones, conglomerates, and a poor gray magnetic ore or a sandstone with grains of magnetite. On the northern end of this spur of the mountain, in the N. W. ¼ of S. E. ¼ of S. 30, T. 20, R. 3 E., the quartzites are fibrous and the conglomerates have flattened rounded pebbles. There is merely a narrow shallow hollow and fault between this end of the spur and a ridge of the (e) Siliceous (Knox) Dolomite and Chert Formation. The strata here at the northern end of the Kahatchee Mountains are especially badly broken up and faulted, the trends of the mountains and spurs being in many directions. On the southern slope of the above cross mountain at its north-east end or in the N. E. ¼ of N. W. ¼ of S. 32, T. 20, R. 3 E., there is the following outcropping:

Outcropping in the N. E. ¼ of N. W. ¼ of S. 32, T. 20, R. 3 E.

[4] *Limonite;* shaly

[3[*Gray Magnetic Ore;* a sandstone with grains of magnetite, so stringy or fibrous as to look like old dry weathered wooden chips, in flags that break up into wedge like pieces that are determined in their length, about 18 inches, by joints in the flags.

[2] Sandstone; massive, with copperas colored splotches over the surface

[1] *Gray Magnetite Ore;* soft or friable, of much better quality than most of this ore hereabouts.

The main or northern mountain of the Kahatchee Mountains is stopped on the north by the above cross mountain or as it butts up against the cross mountain near its north-east end. From its northern end, it has a little west of south trend for near 2 miles to a gap where its strata are broken and doubtless faulted and where it suddenly takes a south-east trend. This main mountain for nearly its whole length, from near Childersburg to near Sycamore, shows more or less of the gray magnetic ore along or near its top. This ore however is usually nothing more than a gray sandstone with magnetic grains. This mountain also carries in places the black waxy limonite. Some of this limonite appears to occupy the same geological horizon as the gray or magnetic ore while some of it appears to be in higher strata as it is found on the southern slope or in the southern spurs of the main mountain. This limonite often overlies the variegated shaly strata at the top of the formation, though it properly belongs lower down in the formation. It is mostly a rough ore or in rocky boulders, though much of it is high in iron. It is also high in phosphorus. Some of it has a fibrous structure and in a few places it is a pot ore. It has been seen in several places on the southern side of the main mountain and in its southern spurs in the S.W.¼ of N.E. ¼ and S. E. ¼ of N. W. ¼ of S. 32, T. 20, R. 3 E. Its rocky boulders in this last named *forty* have white quartzite spots that on weathering out crumble into small fragments like shoe pegs. This ore has also been seen on the mountain spurs in the S. W. ¼ of S. W. ¼ of S. 31, T. 20, R. 3 E., in the western part of S. 7, T. 21, R. 3 E., and in the eastern part of S. 1 and the western part of S. 12, T. 21, R. 2 E. In one, at least, of its outcrops on the side of the mountain in the S. W. ¼ of N. E. ¼ of S. 32, T. 20, R. 3 E., it is associated with the gray magnetic ore. In this same *forty* though farther south, the light and dark ashy gray magnetic ore along the top of the mountain has white quartz streaks in it. The dark ashy gray ore has much more iron in it and is much the more magnetic.

The State Geologist in his report for 1875 speaks of the Kahatchee Hills thus:

"From Oden's Mill westward for three miles the ridge is a single one, but near S. 15, T. 21, R. 3 E, is divided into three or more distinct ridges. In S. 16, T. 21, R. 3 E., on the summit of the mountain, there is a depression called the Dry Pond, which at certain seasons of the year is filled with water which drains off towards the south into Kataula and towards the north into Kahatchee. The Dry Pond is near the point where the undivided range terminates and the branching begins. The most northerly of these branches curves off first north-west and then nearly north, making a sort of an arc of a circle. It has the highest peak in this vicinity, the Crumpler's Peak. Its elevation above the railroad level at Childersburg is 800 feet, and on that side over-looking the plain towards the east and north, it is very steep and precipitous, many places near the summit showing an exposure of sandstone cliffs many feet in thickness."

"The summits of this and other ridges of the kind are quite irregular, some points being 200 to 300 feet higher than others. The highest points are always covered with huge blocks of sandstone, piled in confusion upon each other, so that an undisturbed ledge or one in place is not often seen. In the lower places a kind of shaly sandstone, somtimes almost shales, are always found. These shales have a brownish yellow color. It is rather strange to meet with this alternation of harder and softer strata in going along the strike of the rocks, Such alternations would naturally be found in going across it. The strata here dip towards the south, south-west and west, according to the direction of the strike. Below the summits on the east and north sides, and geologically below the sandstone, are sandy half-metamorphosed greenish slates, then limestones partly gray and cherty; partly blue with argillaceous bands, and partly a very fair blue limestone that makes an excellent lime. Below this, again the partially metamorphosed slates like those above passing downward into the unchanged dolomites of the valley."

"Northward from Crumpler's Peak and a mile or two only from Childersburg, similar sandstones and greenish metamorphosed slates make up a small ridge about 350 feet in height above the railroad level. Their strike in S. 30, T. 20, R. 3 E. is N. 15 deg. E. and their dip is about 5 deg. towards the south-east. Along with them are fragments of the sandy magnetic rock seam at Oden's Mill, on Pope Mountain, etc. Upon Crumpler's Peak.

[illegible] of this rock. In S. 31, there is a large bank [illegible] what appeared to be very good limonite.''

In the Kahatchee Hills, near their southern edge or in the northern parts of S's 21 and 22, T. 21, R. 3 E., there are many outcrops of roofing slate that have been dug into in several places to a depth of from 15 to 25 feet. This slate, in the upper strata of this formation, splits well and is tough enough to be easily punctured, though it is cut up into rhomboidal blocks of from 12 to 18 inches in dimensions by two sets of joints. It appears to be rather soft for roofing purposes, though it is said to have been used during the late war to cover the arsenal at Selma. It would doubtless improve or become harder on being dug into farther. Around its outcrops, there are loose lenticular nodules of milky quartz.

To the south-east or over the above slates, there are outcrops of thin bedded or flaggy siliceous limestones and marbles. These flags are from 2 to 4 inches thick. Some of them are so siliceous as to look like yellow ochrrous quartzites on the weathered or leached surfaces. The leached surfaces extend down to a depth of from 1 to 2 inches. The leached and unleached portions are separated by a sharp distinct line. These limestones and marbles in their outcrops along the north-west crest of a ridge in the S. E. ¼ of S. E. ¼ of S. 21, T. 14, R. 3 E., form a projecting bluff some 30 feet high. They here have curly, concretionary spots and interstratified thin seams of shale. These limestones and marbles are believed to belong at the bottom of the overlying Aldrich (Beaver) Limestones.

Along the wagon road and the Columbus Western Railroad in the Oden Gap in the SW. ¼ of SW. of S. 18, T. 21, R. 4 E., there is the following outcropping:

Oden Gap Outcropping in the S. W. ¼ of S. W. ¼ of S. 18, T. 21 R. 4 E.

(9) Shales; greenish, talcous, forming southern slope of mountain.

(8) *Gray Ore*, Shale; dark gray poor magnetic ore or sandstone with magnetite grains, with reddish streaks along the planes of stratification, in two ledges, about 1 foot each thick, separated by from 1 to 2 inches of shale, the ore in places becomes a shale within a few feet......2 ft.

(7) Quartzite; a hard compact bluish gray rock with irregular flinty streaks, changes in places to a shale within a few feet, about....... 4 ft.

(6) Shale.

(5) *Gray Ore*, Shale; sandstone with magnetite grains and with streaks, spots and flattened grains of white quartz, very hard, in flags from 6 to 8 inches each thick separated by from ½ to 1 inch of shale, about.... .... 12 ft.

(4) Shale; dove colored massive talcous rock with curly spots and cross joints, occurs along the railroad for about 450 yards.

(3) Quartzite; very hard and massive, with a shaly and in places a fibrous structure, slightly talcous with a good deal of milky quartz in streaks and spots, in sharp folds with a north-east and south-west trend ....8 to 20 ft.

(2) Shale, *Gray Ore;* dove and orange massive talcous shale, with, in its upper part, some thin interstratified sandstones with *magnetite* grains, about...... ... .125 ft,

(1) Debris, Shales; to edge of valley or northern foot of the mountain, visible along the railroad for about 150 yards.

An average sample of the gray ore of (8), dried at 100 deg. C., gave the following analysis:

Ferric Oxide	33.900
Silica	58.382
Phosphoric Acid	0.362

[illegible] yards northeast of
mountain. They are
and partly crystalline.
They dip about 30
mountain. They are be-
n of the [e] Silicious
formation. If so, [illegible]
fault have [illegible]
[illegible] it is believed, is about
Fig. 12 [illegible] side [illegible]
of the gap [illegible] with
tain.

streaks and white sandy matter in the scales. Average samples of it, dried at 100 deg. C., gave the following analyses:

	(1)	(2)
Ferric Oxide	80.005	97.190
Silica	13.859	19.390
Phosphoric Acid	0.478	0.222

The limonite in the spurs and hills on the southern slope of the mountain to the east of the Oden Gap properly belongs at the top of this formation, though in places it is in residual loam over the bottom strata of the overlying formation.

This ore has been dug into extensively along the top of a spur in the northern part of S. 19, T. 21, R. 4 E. It is here of fine quality and in some of the diggings appears to be in large quantity. It is principally cellular and in boulders. The fine or wash ore is left in the debris. Some of this ore is botryoidal and some of it is manganiferous. It is associated with yellowish and whitish ochreous quartzites and with some lenticular nodules of milky quartz. See analysis 23 in table at end of this chapter.

The limonite of a deposit on the side of a hill or ridge in the N. E. ¼ of N. E. ¼ of S. 19, T. 21, R. 4 E. is all manganiferous. Some of it is sufficiently manganiferous to be properly called a manganese ore. The soft powdery manganese ore colors the soil a deep black in places. A good limonite, mostly cellular and partly made up of concentric rings of fibrous ore, and partly manganiferous, though seemingly in not very large quantity, occurs on a foot hill in the S. E. ¼ of S. W. ¼ S. 17, T. 21, R. 4 E. It is associated with a yellow ochreous cherty looking rock and with the stringy or fibrous quartzite of the old weathered bone or wooden chip like appearance. It is also associated here with the milky quartz in lenticular nodules and with a conglomerate of a shaly structure in which the flinty pebbles, almost obliterated by metamorphism, appear merely as white flinty specks or flattened scales. Some of the milky quartz nodules are also made up of scales. Limonite deposits have been seen also in the S. W. ¼ of N. E. ¼ of and N. W. ¼ of S. E. ¼ of S. 17, T. 21, R. 4 E. These ore deposits have been dug into in several places to a depth of 20-25 feet without getting through the ore. The ore is hauled in ox-carts 1 to 1 ½ mile to the A. & A. R. R. See analysis of deposit 24 at the end of this chapter.

The magnetic gray ore in an outcrop in the N. E. ¼ of S. 17, T. 21, R. 4 E., is said to be 4 feet thick but to be cut up by partings of shale and clay. A sample of it gave the analysis of outcrop 4 at the end of this chapter.

Along the Montgomery road as it passes through the mountain in S. 16, T. 21, R. 4 E., there is the following outcropping:

Outcropping along the Montgomery Road in S. 16, T. 21, R. 4 E.

(7)	Loam. Chert; red loam with boulders and nodules of slightly shaly chert, covering Aldrich Limestones.	
(6)	Quartzites. Conglomerates. Shales: the flint pebbles of the conglomerates, the top strata. are large translucent grains that are hardly discernible until they become opaque on weathering, dip 30 deg. SSE., about	15 ft.
(5)	Debris, Shales, Sandstones; some	150 ft.
(4)	Shales, Quartzites; the shales, talcous, with curly spots and with milky quartz in interstratified layers of rough nodules and seams. are in hard massive ledges that form bluffs, about	160 ft.

(3)	Shales; talcous, straw colored, reddish in places, some	80 ft.
(2)	Limestones, shales; limestones, partly crystalline, mostly bluish, often shaly on the weathered outcrops, with in places a cherty look and some little chert in streaks and nodules, and with the shales of a golden color and talcous in interstratified thin seams, some	60 ft.
(1)	Shales; talcous, reddish and orange, forming the gradual slope at the northern foot of the mountain.	

The limestones, partly marbles, of (2) are exposed to a great thickness on the north-west side of the mountain to the north east of the above gap or between it and Tallaseehatchee Creek. They are believed to belong at the bottom of (e) Siliceous (Knox) Dolomite and chert formation. If so, the overlying shales are thrust over on them along a fault.

Between Tallaseehatchee and Eumawhee creeks, the poor gray ore or the sandstone with magnetite grains and some black waxy limonite has been seen on the mountain. The following section is given by Maj. Fitzhugh of the magnetic gray ore in the S. E. ¼ of S. 34, T. 20, R. 4 E.

Top, slate and sandstone.
Ore, 7 feet, gray color.
Slate and Sandstone, 25 feet.
Ore, 7 feet, gray color.

The ore of this outcropping gives the analysis of outcrop 5 at the end of the chapter.

The limonite is said to make an extensive deposit on the "Player Place" in S. 11, T. 21, R. 4 E. It is said to be mostly in the low lands. Much of it is pot-ore. Its analysis is the same as that of deposit 83 at the end of this chapter.

The mountain is comparatively low along here and on to its high peak just south of Sycamore. Maj Fitzhugh says that at the foot of the ridge, in a sub-ridge, about ½ mile south of Sycamore, there is a deposit of dark colored magnetic ore, apparently a "float deposit." Several test pits, some of them 10 feet deep, dug into it, showed ore from bottom to top of pits. This ore gives the analysis of outcrop 6 at the end of the chapter.

Andeluria or Pope Mountain is a high conical peak, just to the west of Sycamore, with spurs or ridges and hills around its base. It is but the bent around end, like the head of a bishop's crook, of the Kahatchee Mountains, from which it is separated by merely a narrow gap. Its strata, in their being bent around from the east towards the west, were badly broken up and faulted. The top ones cover the northern and northwestern slopes of the mountain. These gradual slopes have no bluffs or outcrop of such hard massive rocks as occur on the steep southern side of the mountain. They are covered with loose fragments of a poor gray magnetic ore or sandstone with magnetite grains, quartzites, conglomerates, and sandstones. The fragments of poor gray magnetic ore are from flaggy seams and are wedge-shape. They show the shining magnetite grains. Some of them are slightly shaly conglomerates. There is also along with these rocks a black specular like ore, without its red streak, that is very high in iron. It occurs in thin sheets, with a maxium thickness of ½ inch, in and on the quartzites and sandstones. It is most common on the quartz fragments that have come from thin sheets in the other rocks. It is also in small loose pieces. Limonite also occurs on this mountain, but it is confined to the top strata or to the spurs or hills and ridges around the foot of the mountain. It was seen over the sloping north-west side of a ridge in the N. E. ¼ of S. W. ¼ of S. 28, T. 20, R. 4 E., and farther to the north-east in some test pits that were dug down on it on top of the ridge, where it appeared to be stratified with a dip of 30 deg. to 40 deg. to the north-west. It, in these test pits, is of a liver color and makes a very good showing both as to quantity and quality. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	80.780
Silica	10.790
Phosphoric Acid	0.695

Analyst:—J. L. Beeson.

There is also over the top of this ridge some poor sandy gray magnetic ore. The black waxy limonite, mostly *rough* or *rocky*, makes a considerable show along the top of a ridge in the S. E. ¼ of S. W. ¼ of S. 7. T. 20, R. 4 E. It is here in pockets, though of a regular stratified ledge, This ledge is in places a limonite, in other places a quartzite or sandstone, in others a conglomerate, and in still others a poor or sandy gray magnetic ore or sandstone with magnetite grains. The change from one of these rocks to an other is gradual. The limonite is just over a porous fibrous sandstone with the appearance of an old weathered dry bone or chip of wood or piece of bark. This sandstone sometimes is mottled with white and pink spots and has white flint streaks. It also in places has flint scales that are believed to be flattened flint pebbles, and sometimes it is a little shaly. A similar looking rock in places is also just over the limonite. This covering rock is a massive ledge that, like the limonite ledge, is in places a sandstone or quartzite, in other places a conglomerate, and in still others a poor or sandy gray magnetic ore. The conglomerates are usually a mass of flint pebbles, mostly lenticular, of about the size of squirrel shot. The quartzites, with their white specks and streaks of quartz, often have a granitic appearance. These ledges appear to run about S. 20 deg. W., and in places are about vertical while in other places they are bent over towards the north-west until the dip on the outcrop is 75 deg. to 80 deg. to the ESE. Down on the south-east side of this ridge, there are some loose pieces of porous quartzite with the fibrous structure that have sticking to them long crystals of quartz. Still lower down the side of the ridge, along the foot near Sycamore, there were picked up some fine specimens of the black specular like ore. A seam of this ore is said to cross the narrow Sycamore valley in a north-east direction.

The massive granitic looking quartzite, in places a conglomerate, makes a high bluff down on the south-eastern side of the mountain in the N. W. ¼ of N. E. ¼ of S. 34, T. 20, R. 4 E. The State Geologist in his report for 1375 in speaking of the Pope Mountain, boubtless as seen on its southern and south-western sides, says;

"The mass of the mountain is made up of a siliceous sandstone with occasionally some fine conglomerate. On the summit we find these sandstones heavy bedded and having all the distinctive features of the sandstone of the Potsdam chain further north, except that I have not discovered, as yet, any traces of the peculiar *scolithus rods*. The strata strike nearly due east and west, and dip north. Upon the summit, associated with heavy bedded sandstones and conglomerates, are great quantities of thick and thin bedded sandstones impregnated with magnetite to such a degree that fragments of the rock show strong polarity. The usual color of these magnetite-bearing rocks is gray, though after long exposure the color is usually darker, sometimes approaching to black. Besides these we find many pieces of sandstone with lamellae of an iron ore which has the appearance of specular ore, without however its red streak. It is found as a crating, sometimes half an inch or more in thickness, and the richest specimens usually show very little polarity, often none at all.

"These heavy bedded sandstones and conglomerates, I have referred to the Potsdam Group. Coming down the southern face of the mountain, sandy semi-metamorphic slates are first passed over, and then a very siliceous limestone or dolmite alternating with strata of a shaly limestone, (the shaly parts so altered as to resemble the talcoid slates of the Acadian Group.) Some of the limestone is pure white in color, and of compact texture, but upon weathered surfaces it is seen to be chiefly siliceous matter. The limestone beds exposed on the hillside (30 to 40 feet in thickness) seem to vary considerably in their contents of silica; none of it however has been found pure enough to make lime. Below these beds are fragments of semi-metamorphic slates with more abundant fragments of sandstone, similar to that at the summit, down to the foot of the hill, where the dolomite and its chert of Quebec Age begin and fill the interval between this and the mountain three miles further south."

The *Weewoka Mountains* comprise the several mountains or high ridges to the south and the one to the north of Weewoka Creek below Winterboro or north of the Andeluvia (Pope) Mountain. They are of a faulted anticlinal that curves southward at its south-west end. The principal and most south-eastern of the mountains to the south of the Weewoka Creek is known as the *Heacock Mountain*. It is separated at its southern end from the Andeluvia (Pope) Mountain by a low flat valley along Little Tallaseehatchee Creek, across which some of its upper shaly and thin bedded strata may be continuous. The Heacock Mountain, in its north-east trend, approaches Weewoka Creek and thus soon cuts out the south-east and then the north-west of the two mountains or high ridges to the north-west of it, between it and the creek. These mountains are separated from each other by strike faults and, except at their north-eastern ends, by narrow broken valleys. The dip of their strata is to the south-east. The Heacock Mountain is completely cut in two by a gap in about ½ mile of its south-western end. To the south-west of this gap, on its south-east side near its top, there crops out a massive ledge that is in places a black waxy limonite, sometimes good and sometimes rocky, and in other places a sandstone, conglomerate, or quartzite, and in still other places its outcrop is covered by a mixture of loose boulders of all these different kinds of rocks. The same boulder itself is sometimes made up of all these rocks or is partly a good limonite and partly a sandstone, quartzite, and conglomerate. These rocks have all a more or less fibrous structure, though the limonite is in places nearly all *pot ore*. The shells of this concretionary *pot ore* are hard and compact and of a bluish black color with small stalagtitic projections on the inside, of a yellowish ochre color. The nodular limonite, as a general thing, is purer ore than the boulder ore, though these nodules have been derived from the weathering or disintegration of the most rocky ore. The ore is high in iron and phosphorus, as shown by the following analysis of an average sample from the outcrops in the N. E. ¼ of N. W. ¼ of S. 28, T. 20, R. 4 E., dried at 100 deg. C.:

Ferric Oxide	62.427
Silica	10.902
Phosphoric Acid	1.894

Analyst:—J. L. Beeson.

also the analysis of deposit 80 at the end of this er.

conglomerate in places is very full of holes or is s.

onite is said to occur also along the north-west of this mountain. It occurs at the north- foot of the point of the mountain to the east of the gap or in the S. W. ¼ of S. 16, T. 20, E. It is here in a red loam with loose quartzites onglomerates.

this mountain to the north-east of the gap, first on th-east side and then crossing over the top to the west side, there are outcrops of four different reg- stratified seams of gray magnetic ore. The up- e of these seams, it is believed, occupies the same ical position or is the same as the limonite ledge south-east side of the mountain near its top to the west of the gap. The outcrops of these seams of re can be traced along the mountain for nearly es. They at both ends gradually lose the iron ecome quartzites and sandstones. The upper two se seams have been dug into on their outcrops on uth-east side of the mountain in the N. E. ¼ of ¼ of S. 16, T. 20, R. 4 E. The upper of them here rd gray and black ferruginous quartzite, shaly in with thin sheets of black magnetite and streaks ky quartz. The magnetite sheets and quartz are usually together. Some 40 yards farther

down the mountain is the outcrop of the uppermost se
It shows up about as follows :

Outcrop of the Top Gray Magnetic Ore Seam in N. E. ¼ of S. E
S. 16, T. 20, R. 4 E.

[5] *Gray Ore*, Sandstone, Quartzite, Conglomerate; a sandy gray ore, soft like a loose sandy loam, with irregular streaks of white sandstone that carry hard thin plates of black magnetite, and with several thin seams of very hard quartzite, that breaks up into blocks, and also of yellowish shaly fibrous conglomerate .... 30 to 40 ft.
[4] *Gray Ore*, Quartz; a gray ore, soft like a loose sandy loam, with angular pebbles of quartz from the breaking up of thin sheets or seams... 12 ft.
[3] *Gray Ore*, Shale; a very sandy gray ore with streaks of the hard black magnetite and with thin seams of shale.......... 12 ft.
[2] Shale, *Gray Ore;* a yellowish sandy shale with streaks of gray ore.......... 25 ft.
[1] *Gray Ore*, Shale; a gray ore, soft like loose sandy loam, with seams of yellowish shale and thin sheets of hard black magnetite.

Some of this outcrop can be seen to cu
from a steep north-west dip on the surface to a so
east dip at the bottom of the test pit, 25 feet deep.

To the north-east, on and near the top of the m
tain in the N. W. ¼ of N. W. ¼ of S. 15, T. 20, R. 4
the upper three seams can be seen in their outcrops.
these outcrops the middle seam is about 5 feet t
while the other two are about 8 feet each thick
middle seam is some 75 feet under the top seam and s
15 feet over the lower one. Under this lower one s
35 feet there is another seam of gray ore, but it is
ered up here. These outcrops are soft or friable e
to be easily crushed with the hand. Their dip
deg to 80 deg. to the south-east. The top seam i

est or carries the most iron. It is said to have about 7% of silica. It was dug into on the outcrop on top of ne mountain and about 100 tons of it, so said, was hipped and smelted in the furnace. The report is that made an iron too brittle to even hold up its own eight, These seams can not be seen very far to the orth-east of here. The steep northwest side of the ountain under them is covered with loose nodules and mall boulders of conglomerates, sandstones and quartz- es, and with loose irregular pebbles of milky quartz nd small thin pieces of black magnetite. This magne- ite is from the weathering of the other rocks, on and in which it occurs in thin sheets. It, though usually very igh in iron, has sometimes in and on it thin streaks nd small specks of milky quartz. Some pieces of it are ighly magnetic while others are not at all so. All of hese rocks have a fibrous structure and look as if they ad been compressed.

The most north-west of the mountains to the south of Weewoka Creek gives out just to the south-west of the ast named outcrops. On its steep north-west side just o the south-east of Riser's Mill in the N. W. ¼ of N. W. ¼ of S. 16, T. 20, R. 4 E., there are outcrops of he 4 seams of sandy gray magnetic ore. They are here owever nothing more than dark gray shaly sandstones with some magnetite grains. Their dip is about 75 leg. to the south-east. Under them, there is a bluff of imestone and marble 35 to 40 feet high, then debris for ome 50 feet to more limestone and marble hat is visible, for about 20 feet, to the bed of the reek. The limestone and marble may be continuous nder the debris between their two outcrops, although ich is not believed to be the case. They are quite re, though some of them have thin streaks of shale.

They are believed to be Aldrich Limestones and to be separated from the overlying strata by a thrust-fault. The middle mountain on the south side of the creek is merely a short ridge.

The mountain on the north-west side of Weewoka Creek is known as the *Mallory Mountain*. Its strata are somewhat different from those of the other mountains. They are not quite so much metamorphosed. They consist of, as seen along the road that leads over the mountain from Weewokaville, of interstratified yellowish and greenish talcous shales and talcous sandstones, with some conglomerates and limonites. The sandstones are shaly in places, the conglomorates are homogeneous masses of rounded flint pebbles of about the size of squirrel shot, and the limonites are mostly rocky, though often of good quality. The dip is steep and to the south-east. The limonites are all to the north-west of the shales and sandstones and hence seemingly under them. They appear to extend at intervals, at least, the whole length of the mountain. They have been dug into and shipped considerably at what is known as the Riser Mines. The diggings to the south-west of the above road are on the top and steep north-west side, near the top, of the mountain. They are in boulder ore, mostly rocky, though much of it is high in iron, while the numerous diggings to the north-east of the above road, in the spurs or low hills and ridges along the north-west foot of the mountain, are principally in pebbly ore of good quality. This pebbly ore in places completely covers the ground, though it has mixed with it some sandstones and conglomerates that have doubtless rolled down from the mountain. The growth over these low hills and ridges is mostly long leaf pine. It may be that some of the most north-western of these ore deposits belong at the bottom of the (e) Siliceous (Knox) Dolomite and Chert Formation. The ore is mostly compact, though some little of it is cellular. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	68.541
Silica	15.875
Manganese Oxide	1.296
Phosphoric Acid	0.871

Analyst:—J. L. Beeson.

See also analysis of deposit 76 at the end of this chapter.

Mr. Nitze, in speaking of the Riser Mines says: "The works consist of 9 openings in the S. W. ¼ of S. E. ¼ of S. 8, T. 20, R. 4 E. The company has their own branch road about 3½ miles long to the E. T., Va. & Ga. R. R. Shipments of ore are from 100-150 tons per day, though it is said that three times this much could be mined if the railroad would furnish cars. The ore brings from $1.25 to $1.35 per ton, F. O. B. cars at E. T., Va. & Ga. R. R. Mining is let out by contract work at 55 cts. per ton F. O. B. mine cars. Small lump ore is picked out and gravelly ore is screened through 5-8 inch wire mesh. Large boulders are blasted by first springing hole with dynamite and then firing with a charge of dynamite and powder. There is great necessity here for proper ore washing machines. At some of the openings a great deal of the loose ore in the clay must be abandoned until the summer time, so that it can dry enough to be screened. A sample of screened ore, 5-8 mesh, was taken at random from 4 cars and weighed, washed thoroughly in the creek, dried and reweighed, with the following result:

Weight before washing.....7 lbs.
" after " .....6 "
Loss = 14.3%

"The ore shows up well all over the surface and in all test pits which have been dug. The vertical distance from the top of the ridge to the lowest point of the workings, measured by the aneroid barometer, is about 200 feet. The greatest depth to which the openings have been worked, with solid ore on the bottom, was from 20-25 feet. At the base of most of the larger trees, lumps of ore have been pushed up by the roots. Timber is good; pine and oak, the former abounding."

The two analyses of deposit 4, Mr. Nitze's report, at the end of this chapter, are of this ore deposit.

There is on the mountain, just to the south-east of its top near its north-east end or just back of Dr. Heacock's residence in the N.E. ¼ of N.E. ¼ of S. 9, T. 20, R. 4 E., a considerable deposit of good ore, as shown in the test pits. The surface ore however is poor both in quantity and quality, occurring as sandy gravels with a few nodules. In one of the pits the surface rounded flint pebbles extended down about 3 feet to where the nodular ore becomes almost solid. Just to the north-west of this deposit or along the top of the mountain, there are talcous sandstones, and to the south-east of it or down on the south-east side of the mountain, there is some gravelly limonite along with loose angular flint gravels and small pieces of sandstones.

At the south-east foot of the mountain here and at its north-east end, in the S. W. ¼ of N. W. ¼ of S. 3, T. 20, R. 4 E., there are outcrops of white *steatite* but it is too soft and shaly to get in large enough pieces to make it of value. The steatite is at the top of this formation or the bottom of the overlying Aldrich (Beaver) Limestones.

Alpine and Talladega Mountains. This belt of mountains, over 15 miles long and about 1 mile wide, extends along just north-west of the East Tennessee Virginia and Georgia Railroad from north of Alpine to some 6 miles north east of Talladega. It is of a faulted unsymmetrical anticlinal with a general north-east and south-west trend. It is just to the south-east of a fault. Some of its strata in places may be duplicated by faults. Along its south-east edge, there is for the greater part of its length one or usually two parallel ridges. These mountains gradually die out at both their south-west and north-east ends as the anticlinal sinks and its strata become covered by the overlying (c) Montevallo (Variegated) Shales and Sandstones and Aldrich Limestones and the fault along the north-west edge disappears. Their strata are very variable and so the hard quartzites and conglomerates are much more highly developed in places than in others and the mountains have high peaks and low gaps. The highest of these peaks, the "Three Sisters" and "Mt. Parnassus," range from 600 to 1000 feet above the level of the E. T. Va. & Ga. R. R.

These mountains have in many places in their upper strata the black waxy limonite but none, so far as has been seen, of the gray magnetic ore of the other mountains. This want of the gray magnetic ore must be due to these mountains being farther away from the metamorphic region and hence of less metamorphosed strata than the other mountains.

These mountains for several miles to the north-east from their south-west end are of two mountains with a deep hollow, the "dark corner", between them, up which runs the Plantersville and Talladega wagon road. This deep hollow is belived to be of older or lower strata than the quartzites and conglomerates of the two mountains, though it may be of newer and higher strata from the presence of a fault along its south-east edge.

On the end of a spur on the south-east side of the south-east mountain or in the S. E ¼ of S. E. ¼ of S. 16, T. 19, R. 4 E., there is an outcropping of the black waxy limonite. This ore shows also in the upper or north-east mouth of the "dark corner" or in T. 19, R. 4 E., in the N. E. ¼ of N. W. ¼ & N. E. ¼ of N. E. ¼ of S. 16; and N. W. ¼ of N. W. ¼ of S. 15; and S. W. ¼ of S. W. ¼ & N. E. ¼ of S. W. ¼ of S. 10. These deposits appear to have considerable ore in them, though the ore is mostly rocky. Some of the ore however is of very good quality.

The main mountain just to the north-east, as it crosses the line between T's 18 & 19, is very high and is known as the "Sleeping Giant," and its three high peaks as the "Three Sisters."

The State Geologist in his report for 1875, page 133, says: "In making the ascent of the mountain at Alpine at its base is seen an outcrop of shaly cherty limestone that affords some beautiful specimens of oolitic limestone and belongs in all probability to the Dolomite of a later formation, which has been brought up by faulting to a level with this. At one point half way up the mountain there is exposed a bluff of sandstone, striking about 5 deg. east of north and dipping about 85 deg. to the south of east. One layer here exposed is a black ore of iron, with somewhat resinous lustre, fragile, and having somewhat the appearance of coal. A partial analysis of this, by Mr. Britton, shows the following composition:

Metallic Iron	56.74%
Insoluble siliceous matter (white sand)	0.76
Sulphur	none
Phosphorus	1.52
Manganese	trace

"An exceedingly large amount of phosphorus, equivalent to about 3.% of phosphoric acid, is the noticeable feature of this ore.

"A thin coating of limonite is seen in many places on the exposed faces of the rock, and indeed, here as well as elsewhere, the Potsdam Sandstone seems to hold a considerable quantity of iron, either as pyrite or as its decomposition product, limonite.

"Near the summit, the heavy ledge of sandstone which forms the crest of the mountain begins. On account of the thickness of these beds, the rock appears almost massive at times, but where the bedding could be made out the strata show a dip of between 85 deg. and 90 deg. towards the south-east. Upon the summit of this and other mountains of this formation, are huge piles of rocks, the broken remnants of once continuous ledges. Upon these a scanty growth of oak, usually gnarled and often stunted, prevails.

"The large amount of iron in the sandstones of this formation is shown by the chalybeate springs which have their sources in the mountains."

The limestone spoken of at the base of the mountain must be Aldrich (Beaver) Limestone.

Limonite of very good quality, in boulders, along with sandstones, conglomerates, and quartzites, occur high up on the south-east side of the mountain in the S. W. ¼ of S. W. ¼ of S. 35, T. 18, R. 4 E. It is also found, though mainly rocky, lower down the mountain, on spurs, in the N. E. ¼ of N. W. ¼ of S. 2, T. 19, R. 4 E., and as a black, waxy ore, high in iron and phosphorus on the south-east side of a skirting or parallel ridge of the mountain, along with loose sandstones, quartzites, and conglomerates, in the N. W. ¼ of S. E. ¼ & N. E. ¼ of S. E. ¼ of S. 2, T. 19, R. 4 E.

The top of the mountain in the Renfro Gap is principally of a white quartzite, though some of it is flesh colored. In this gap and in other gaps to the north-east, there is a deep red sandy loam near the top of the mountain on the north-west side. This loam looks as if it might cover the outcrops of limestones or calcareous strata. On top of or to the south-east of the massive quartzites and conglomerates of the mountain in the N. W. ¼ of N. W. ¼ of S. 30, T. 18, R. 5 E., there are boulders of limonite, and, along with loose sandstones over the spurs and knolls along the foot of the mountain in the S. W. ¼ of S. 19, T. 18, R 5 E., there is a great deal of pebbly limonite with some few nodules.

The Chocco Springs, consisting of a couple of chalybeate springs and several freestone springs, are in a gulch down on the south-east side of the mountain in the south-east corner of S. 17, T. 18, R. 5 E.

The *Lawson Limonite Bank* is near the south-east foot of the main mountain in the S. W. ¼ of S. 16, T. 18, R. 5 E. Its ore, in boulders, nodules, and gravels, is seemingly in large quantity. This ore is covered by from 4 to 5 feet of float or of loam with loose standstones and conglomerates. It is for the most part a liver colored ore, compact and spongy, and of very good quality, as shown by the following analysis of a good average sample dried at 100 deg. C.:

Ferric Oxide	75.610
Silica	12.258
Phosphoric Acid	0.536

Analyst:—J. L. Beeson.

See also analysis of deposit 59 at the end of this chapter.

On lower ground than this bank, there are spots along the foot of the mountain that are literally covered with pebbly ore.

Along the Talladega and Truss Ferry road, there are two of the parallel ridges to the south-east of the mountain. These ridges are separated from each other, and also from the mountain, by a narrow valley. The smallest or most south-east ridge has along its top yellow ochreous sandstones, with quartz crystals over their surface, that are often full of holes or spongy. These sandstones become in places a limonite, from the poorest to the best quality, that is frequently manganiferous. The other ridge has along its top a very hard bluish granitic looking quartzite with prominent streaks of flinty matter. The narrow valley between these ridges is of a light yellowish argillaceous shale that weathers into a very good gray brick clay, while the one between the north-west ridge and the mountain is of deep red sandy loam. The rocks of the mountain in places are of yellowish ochre quartzites somewhat similar to those of the south-east ridge. They however vary, as do those of the ridges. Along the north-west foot of the south-east ridge in the T. 18, R. 5 E., N. E. ¼ of S. 15, and N. W. ¼ of S. 14, there are several limonite old diggings. The ore is a dark liver color. It is mostly hard and compact, though some of it is spongy. Some of it has white siliceous specks An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	74.626
Silica	14.300
Phosphoric Acid	0.160

Analyst:—J. L. Beeson.

The *Poor House Limonite Bank* is an exception to most of the other banks in that it is on the north-west side of the mountain. It is along the thrust fault and it may be that it belongs to the bottom strata of the (e) Siliceous (Knox) Dolomite and Chert formation to the north-west of the fault. It is just to the east of the Jackson Trace Road some three miles from Talladega. Its ore, in a red sandy loam, is principally in boulders and nodules. It does not make much of a surface show, though it appears to be in considerable quantity. It is a dark liver colored ore, mostly compact though sometimes porous. A good average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	76.123
Silica	10.102
Phosphoric Acid	0.371

Analyst, J. L. Beeson.

See also analysis 36 at the end of this chapter.

To the north-east for a mile, there is a narrow valley along the fault or north-west foot of the mountain. On the north-west side of this valley, in the edge of the piney woods in the N. E. ¼ of S. W. ¼ of S. 2, T. 18, R. 5 E., there is a row of quartzite boulders with more or less black waxy limonite in and on them. On the low ridge formed by these rocks a short distance to the north-east, there is some shaly sandy limonite. These rocks to north-west of the narrow valley may belong to (e) Siliceous (Kox) Dolomite and Chert formation.

To the south-east of the narrow valley, at the foot of ne mountain or of a north and south spur, in the N.W. ¼ f S. E. ¼ of S. 2, T. 18, R. 5 E., there is a deep shaft hat was sunk in search of stone coal. This shaft is in he outcrop of a light gray shaly sandstone that is someimes a sandy shale with a talcous appearance and feelng along its planes of stratification. Some of this sandtone is banded with gray and blue streaks across the tratification, while some of it, when freshly quarried, s very blue and some of it has black streaks running hrough it. Some of it, full of very large cubical crysals of pyrite, readily slacks, as it is said, or crumbles on xposure to the weather.

Quartzites, and conglomerates occur along the top of e spur just to the east of the shaft. The conglomeres in places are of large angular cherty looking pebes or small nodules held together by oxide of mangane and in other places of compact quartzites with well nded small flint pebbles and streaks and patches of ack waxy limonite. On the side of the north end of is spur there are several chalybeate and freestone rings. This spur is a kind of connecting link between e south-west end of a mountain or high ridge that tinues on to the north-east for some distance and the rth-east end of the main mountain to the south-west, e the south-east mountain, called the Shaffer or Ball ountain. The Shaffer or Ball Mountain has along its p here at its north-east end in the N. E. ¼ of S. W. ¼ S. 11, T. 18, R. 5 E massive boulders of quartzite ith the black waxy limonite in streaks and spots.

This belt of mountains end on the north-east in a coupe of parallel ridges of two unsymmetrical anticlinals that rapidly sink towards the north-east.

(c) *Montevallo* (*Variagated*) *Shales and Sandstones and*

Aldrich (*Beaver*) *Limestones.* This formation, from 2000 to 3000 feet thick, covers some 200 square miles of the surface area of Talladega County. Its partly metamorphosed strata in many places are hard to distinguish from those of the (b) Weisner (Chilhowee) Sandstones. They, still more metamorphosed, appear to form some at least of the (1) Crystalline, (a) Talladega (Ocoee) Slates, Conglomerates and Quartzite. This formation is of belts to the south-east of the mountains of the (b) Weisner (Chilhowee) Sandstones that are joined together by narrow necks, into one long irregular tortuous belt. It also includes the valley of red lands of Aldrich Limestones between the (b) Weisner (Chilhowee) Sandstone mountains to the south-west of Sycamore and the (1) Crystalline strata, and the synclinal trough between the Kahatchee Hills and the Katala Mountains. This synclinal and the valley between the (b) Weisner (Chilhowee) Sandstone mountains to the south-west of Sycamore and the ridge, usually sharp crested, along the north-west edge of the *marble valley*, are both put down on the State Geological Map as belonging to the (e) Siliceous (Knox) Dolomite and Chert Formation. They are underlaid by the Aldrich Limestones, for the most part blue limestones with thin cherty sheets.

This formation in Talladega county makes also a couple of much smaller detached belts. The larger one, to the north-west of the Talladega Mountains, crosses Choccolocco Creek at the Jackson Shoals, and the other one occurs along the edge of the (1) Crystalline strata to the north-east and south-west of Ironaton. It also embraces the southern edge of the variagated shales to the south-east of Coldwater Mountain and also make a small detached patch to the south-east of Childersburg.

The ridge of this formation, usually sharp crested, along the north-west edge of the marble valley extends from down in Coosa County to the north-east of Sycamore, though, for several miles to the south-west of Sylacauga, it is broken up and is of low overlapping and not very distinct ridges, Sylacauga being on the south-west end of the ridge to the north-east of the broken up section. This ridge has along its top for the greater part of its length a massive quartzite ledge and over its sloping south-east side usually dark colored and variegated shales with milky quartz nodules, and on its steep north-west side outcrops of blue limestones (Aldrich Limestones), and of roofing slate. The limestones are sometimes marbles. The quartzite along the top on weathering has often a stringy or fibrous appearance, looking somewhat like an old weathered bone or wooden chip. It is sometimes a very good rose colored jasper with slick splotches of white flint, while in other places it is a slightly shaly friable sandstone with white flint streaks and flattened scales. It is also spongy or porous in places. Marbles have been struck in wells on the top of this ridge in places, as at Mr. James Martin's in the N. W. ¼ of S. W. ¼ of *S.* 4, T. 22, R. 8 E., and at Sylacauga. A very hard and compact dark blue siliceous rock, called *black marble*, crops out along the north-west foot of this ridge near Dr. G. A. Hills' in the S. E. ¼ of N. E. ¼ of S. 25, T. 21, R. 3 E. It has been quarried some little on an outcrop in a low flat place just to the north-east. It is in flags from 6 to 18 inches thick and, though it is siliceous and has some thin cherty sheets, it is said to take a fine polish. Bluffs of partly limestones and partly marbles crop out on the north-west side of this ridge also to the north-east of Sylacauga. They all belong at the top of the Aldrich Limestone. The *Fluker Quarry* on the north-west side of the ridge in the N. E. ¼ of N. E. ¼ of S. 29, T. 21, R. 4 E., has an outcropping of large boulders of calcite, and of a very hard cherty limestone, and of orange colored quartzites. The calcite was used as a fluxing rock. It has seemingly been about exhausted. The limestone is in flags, from 12 to 18 inches thick, that have in them along the planes of stratification some beautiful dendritic depositions, and between the flags in places a greenish talcous shale in thin seams. The ridge here on its south-east side is covered with a red loam with some limonite. The limestones and marbles (Aldrich) of the north-west side of this ridge makes an especially fine outcropping along Tallasseehatchee Creek where crossed by the Alabama Mineral Railroad. At the north-west foot of this ridge in the S. E. ¼ of S. W. ¼ of S. 1, T. 21, R. 4 E., there is an outcropping of roofing slate. It is tough and splits well, but it is cut up by joints, from 6 to 12 inches apart, into rhomboidal blocks. If properly opened, it might lead back to first-class roofing slate.

The valley of the lower strata of this formation or of the Aldrich Limestones to the north-west of the above ridge show many outcrops of its blue limestones. These outcrops can be seen all along Cedar Creek and its branches. They sometimes form glady places with a growth of red cedar and have in them some big limestone springs. They, on the south bank of the creek on John Burke's land in the N. E. ¼ of N. E. ¼ of S. 28, T. 21, R. 3 E., form a bluff some 150 feet high. They are here a quite pure dolomite though the lower ones have some small cherty specks. They are covered by talcous or partly metamorphosed shales. See analysis of limestones, outcrop 1, at the end of this chapter.

To the east of this point, between it and the Oden Gap, the valley appears to be principally of the variegated shales. To the south-west, near the northern edge of the valley, there is a line of knolls for a mile or more in length with good limonite over their tops. On one of the eastern of these knolls in the S.W. ¼ of S. E. ¼ of S. 29, T. 21, R. 3 E., the limonite is in boulders. It does not however make much of a surface show here, nor does it show to be very abundant until 3 knolls in the N. E. ¼ of S. W. ¼ of S. 32, T. 21, R. 3 E., are reached. These 3 knolls have about 3 acres each over their tops that are literally covered with nodules and small boulders of ore, notwithstanding that a great deal of the ore has been picked up and heaped into piles to enable the land to be cultivated. A similar knoll to these just to the east of them shows only an occasional nodule of ore. It is covered with a very spongy cherty rock with streaks and specks of white quartz and with its pores lined with quartz crystals. See analyses 16 and 17 in table at end of this chapter. In another knoll to the south-west, about in the N. E. ¼ of S. 1, T. 22, R. 2 E., there are some limonite diggings. This and the other limonites of the banks in the residual loams over Aldrich Limestones are believed to have come from the upper strata of the Weisner Formation.

The limestones of the above valley or along Cedar Creek above Fayetteville are separated from similar limestones that underlie Fayetteville by a low anticlinal ridge of underlying shales and sandstones that leaves or branches off from the Kahatchee Hills at their most south-east point or just east of Fayetteville and in a few miles to the south-west connects on to similar strata of the Sulphur and Chalybeate Springs and Mountains.

The limestones under Fayetteville are of the narrow broken faulted unsymmetrical synclinal trough between the Kahatchee Hills and Katala Mountains. This trough, though it is not over ½ mile wide from east to west, is from 8 to 10 miles long from north to south. It is not only broken but it has also very ragged edges from the extending out into it, especially from the east or from the Kahatchee Hills, of hills and ridges of the Kahatchee Hills. These hills and ridges extend clear across the synclinal or are its surface strata for a couple of miles near its middle part. As their strata are older or under the limestones of the synclinal trough the latter, as they occur in the southern and northern parts of the synclinal trough, are necessarily cut in two by them. The limestones can be seen to immediately overlie their strata or the strata of the Kahatchee Hills on each side of the narrow anticlinal as it crosses Cedar Creek just to the south-east of Fayetteville. These limestones in the narrow synclinal trough at and near Fayettville, where they are believed to be thickest, are said to be not over 10 feet thick, as has been shown in the digging of wells.

In the southern end of this narrow synclinal trough, over a belt of shales some 250 yards broad in the N. W. ¼ of N. W. ¼ of S. 15, T. 22, R. 2 E., there are several deposits of limonite. This ore is principally nodular and in places literally covers the surface. There is a small deposit of it on the south-east edge of the synclinal, in Mr. M. L. Hamilton's horse lot in the N. W. ¼ of N. W. ¼ of S. 14, T. 22, R. 2 E. See analyses 1 and 2 at the end of this chapter. A sandy limonite, in considerable quantity, occurs on a low ridge or knoll of shales near the center of the synclinal in the N. W. ¼ of N. W. ¼ of S. 2, T. 22, R. 2 E. This low ridge or knoll is the southern point of the short mountain just to the south-west of Fayetteville and in line with the eastern prong of the Katala Mountains. Its shales most probably belong at the top of the underlying formation.

The upper strata of the Aldrich (Beaver) Limestones, partly marbleized, make several fine exposures along the A. & A. R. R. between Sylacauga and the crossing of Tallaseehatchee Creek. Analysis of outcrop 2 at the end of this chapter is of a bluff on the steep north-west side of the ridge in the N. E. ¼ of S. 22, T. 21, R. 4 E.

The limonites in the ridges and spurs along the foot of the sloping sides of the mountain to the east of Oden's Gap and of the Andeluvia or Pope Mountain and Heacock Mountain, sometimes overlie the bottom strata of this formation, though they have come from the upper strata of the underlying formation.

The Singleton deposits, seemingly large, on some knolls in the N. ½ of S. W. ¼ of S. 19, T. 20, R. 4 E., overlie perhaps the upper strata of this formation, though their ore must have come from the lower strata of the overlying formation.

The limestones and marbles of the bluff across the creek from Riser's Mill or Weewokaville and in the creek and under the seams of magnetic gray iron ore that crop out higher up on the side of the mountain, are believed to belong at the bottom of this formation, or to be Aldrich Limestones. If so, they are just to the north-west of an overtrust fault along which the underlying formation with its magnetic ores has been pushed over on top of them. The uppermost of these limestones and marbles are about 100 feet above the bed of the creek, though the debris covering the central half of this elevation may cover other strata.

About 2 acres of the valley land of Weewoka Creek in the W. ½ of S. W. ¼ of S. 2, T. 20, R. 4 E., over strata of this formation, are literally covered with nodules and small boulders of porous or spongy limonite of good quality. This ore, it is believed, is confined to the surface and has come from the upper strata of the underlying formation. See analysis of deposit 7'', Mr. Nitze's report, at the end of this chapter.

The steatite outcrops at the north-east end and south-east foot of Mallory Mountain or in the N. E. ¼ of S. 9 and S. W. ¼ of N. W. ¼ of S. 3, T. 20, R 4 E., belong at the bottom of this formation or the top of the underlying formation.

The belt of Cambrian strata including the Weewoka Mountains extends to the north-east to at least within a mile of Talladega Creek. It may extend several miles farther to the north-east, as there is a patch of its strata in the line of its continuation to the north-east or between 1 and 2 miles south of Talladega.

A roofing slate crops out along Weewoka Creek in the W. ½ of S. W. ¼ of S. 2, T. 20, R. 4 E. It splits well and is tough, but it is cut up by joints into rhomboidal blocks. A proper opening of it, however, might disclose a good quality of roofing slate.

A sandstone near the top of this formation, a few hundred yards to the south-west of Mr. O. M. Reynolds' residence in S. 1, T. 20, R. 4 E., has been quarried some for building purposes.

Another outcropping of slate, not so tough and of a delicate pinkish color, occurs in the S. E. ¼ of S. W. ¼ of S. 19, T. 19, R. 5 E. It is in massive boulders and splits well, though it is cut up by joints and is too soft to be of value for roofing purposes. Just to the south-east of this slate outcropping, there is a low ridge with, r its surface, some little limonite along with cherty s that have quartz crystals sticking to them. There so to the north-west of the line of strike of the ve slate outcropping some limonite and rounded flint bles. The limonite is partly in thick sandy sheets partly of good pocket ore. It overlies the top strata his formation, though its ore is believed to have come n the bottom strata of the (e) Siliceous (Knox) omite and Chert Formation. This ore has been dug te extensively at the *Carlton Bank* in N. W. ¼ of W. ¼ of S. 19, T. 19, R. 5 E.

he Alpine and Talladega Mountains belt of Cambrian ta extend to the north-east to Cheawha Creek or for 8 miles to the north-east of Talladega. The E. T. & Ga. R. R. is within this belt from a couple of es west of Alpine to a couple of miles east of Talla-a. In the narrow neck that connects it on to the ewoka Mountains belt, there is, in the S. E. ¼ of E. ¼ of S. 5, T. 20, R. 4 E, over the top strata of this nation a knoll of from 5 to 7 acres in extent with spots ts north-west side of seemingly almost solid masses monite. The ore of some of these spots appears to onfined to the surface, while in others it extends sev- feet, at least, below the surface. It is principally a ngy or porous nodular ore, though some of it is in bles and some in boulders.

n outcropping of shale on a low ridge in the S. ½ of W. ¼ of S. 32, T. 19, R. 4 E., has been shafted down in search of stone coal, because the dentritic ferru-ous depositions between its layers were taken for fos- ferns. These depositions are found between all of the inae of the shales, however thin they may be. Those the same block of shales have very similar fern like tlines, though some of them are more perfect than hers.

The variegated shales can be seen skirting around the south-west end of the Alpine and Talladega Mountains just north of Alpine, and extending up their north-west as well as their south-east side. On the north-west side, however, they have been seen to be continuous for only about 4 miles to the north-east. Still farther to the north-east, on this north-west side, they are, for the most part at least, engulfed in a fault. On the south-east side of the mountains, however, they form a broad belt through which runs the E. T. Va. & Ga. R. R.

The black waxy limonite of the foot hills and ridges of the Alpine and Talladega Mountains, spoken of under the Weisner (Chilhowee) Sandstones, occur in places over the bottom strata of this formation. Limonite of very good quality, in nodules and pebbles, covers a knoll near the south-east edge of the belt in the S, W. ¼ of N. W. ¼ of S. 14, T. 19, R. 4 E. A light colored brick clay is derived from the weathering of some of the bottom shales of this formation.

The *Aldrich Limestones* are to be seen in many places along the south-east foot of the mountains. They give rise to a deep red loam.

The two parallel intervening valleys between ridges of quartzites, conglomerates, and limonite, to the north-west of Talladega, may be partly of the bottom strata of this formation. These valleys are of shales and limestones. The northern half of Talladega is underlaid by the upper variegated shales of this formation. They show up well along the E. T. Va. & Ga. R. R. just west of the Talladega depot. They are here in waves with a north-east and south-west trend and show several small faults. In the upper part of these shales, in a street to the north-east of the Southern Hotel, there is an outcropping of roofing slate, These variegated shales, mostly of a light yellowish color on the weathered outcrops, make along the Jemison or Turner Mill road a barreny looking piney woods country with lime sinks. In this barreny looking country, in Mrs. S. E. Smith's horse lot in the N.E. ¼ of N. E. ¼ of S. 13,T 18. R. 5 E., there is an outcropping of a pinkish roofing slate. This slate splits well, but it is not tough or hard enough to be of value for roofing purposes. Here at Mrs. Smith's, there is a natural well or sink that extends down to a running stream of water. To the north-west of this barreny country, between it and the foot of the mountain, there is a belt of red loam that is underlaid by a blue limestone. This limestone is the Aldrich Limestone at the bottom of the formation.

In its covering red loam, there is in places some good limonite that is believed to have been derived from the upper strata of the underlying formation. In a deposit of this ore in the N. E. ¼ of N. W. ¼ of S. 23, T. 18, R. 5 E., there is a large digging. In this digging, just over the limonite, there is a layer from 0 to 3 feet thick of very good red ochre with some small gravels and nodules of limonite.

Limonite, in considerable quantity, occurs over the variegated shales with interstratified thin seams of gray, reddish, and yellowish sandstones, in the upper part of the formation, on the top of a southern spur of the ridge or mountain in the S. W. ¼ of S. 5, T. 18, R. 6 E. Much of this ore is porous and of good quality, though some of it is rocky or very siliceous. Some little of this limonite shows along the Easta Boga road as it crosses the broad or double ridge just to the north-east. The interstratified sandstones have streaks and splotches of flinty matter and cavities that are lined with quartz crystals. Here at their northern end also, the Alpine and Talladega Mountains have variegated shales on both sides of them. Those on the north-west side however do not extend very far to the south-west before they become engulfed, for the most part at least, in a fault. They form a narrow belt of piney woods and have along their north-west edge a ridge of interstratified variegated sandstones. At the extreme north-east end of the Alpine and Talladega Mountains, on the west bank of Kelley's Creek some 200 yards above Mr. Shank Jennison's Mill or in the N. W. ¼ of S. 33, T. 17, R. 6 E., there is a quarry in an outcropping of yellow ochreous sandstone. This outcropping is of an unbroken unsymmetrical anticlinal with an east and west trend. The northern dip is much steeper than the southern. This anticlinal rapidly sinks to the north-east, the sandstones disappearing under overlying strata. These sandstones are fine building stones, as they are soft enough to be cut or sawed when freshly quarried and as they harden on exposure. They are covered by a yellowish shale with interstratified thin flaggy sandstones.

The Jackson Shoal belt, nearly 1 mile broad and some 10 miles long, dies out to the north-east in a little over a mile to the north-east of the Jackson Shoals in Chocolocco Creek. It is made up of yellow, buff, gray, greenish, and reddish brown shales with interstratified variegated sandstones. It has none of the Weisner (Chilhowee) Sandstones of the other belts. It makes the Jackson Shoals in S. 22, T. 17, R. 5 E. These beautiful shoals, about ½ mile long, are made up of parallel bars from 35 to 40 yards apart. The following section is from the State Geologist's report for 1875 :

Section of Jackson Shoals in S. 22, T. 17. R. 5 E.

(4)	Limestones; almost black, visible about	20 ft.
(3)	Sandstones; variegated, ripple marked with fucoid impressions, forms the top of the shoals, about	60 ft.
(2)	Dolomites; usually quite cherty, about	60 ft.
(1)	Sandstones, Shales; alternating, variegated, from	500 to 900 ft.

Limonite occurs near the south-east edge of this belt on a hill in the S. W. ¼ of N. E. ¼ of S. 5, T. 18, R. 5 E. It however does not cover much area and appears to be confined to the surface. It is in large and small boulders, and is mostly cellular and of good quality. It has along with it considerable pyrolusite in soft smutty boulders. Limonite, in small deposits, occurs also to the north-east, though near the south-west end of this belt, along with a spongy chert in a broken piney woods. It is mostly spongy and of good quality. Some of these deposits are to be found in the S. E. ¼ of N. W. ¼ and N. W. ¼ of N. E. ¼ of S. 4, T. 18, R. 5 E. This ore in nodules, covers a knoll of light yellowish shale in the N. W. ¼ of S. E. ¼ of S. 28, T. 17, R. 5 E. See analyses 37, 38, 39 at end of this chapter. These deposits, though they overlie the top strata of this formation are believed to have derived their ore from the bottom strata of the (e) Siliceus (Knox) Dolomite and Chert Formation.

The Ironaton belt is a narrow broken valley along the north-west edge of the (1) Crystalline strata from some 2 miles south-west of Ironaton to the north-east up into Calhoun County. Its strata are more or less metamorphosed. The talcous variegated shales in S's 34 & 35, T. 18, R. 6 E. dip 25 deg. to 80 deg. to the north under high hills and ridges of deep red loam with large banks of limonite. A low short ridge of quartzite boulders with a cherty look that are in places ferruginous and of a yellow ocherous color, crosses this narrow valley or belt diagonally from east to west just north of Ironaton. Limonite, as a black waxy rough or rocky ore, forms a knoll in the N. W. ¼ of S. E. ¼ of S. 13 and one also in the S. E. ¼ of N. E. ¼ of S. 14, T. 18, R. 6 E. Along with this ore, in a red loam, there is some milky flint in thin seams and oval nodules. To the north-east, along the south-east edge of the valley or belt, between it and the broken country of hydromica shales, there are outcrops of limestones, partly marbles, that are probably of the overlying (d) Coosa (Flatwood) Shales and Limestones. Limonite, in rough or rocky boulders, along with loose quartzites carrying streaks of milky quartz, and loose pebbles of milky quartz, lies scattered over the surface in the N W. ¼ of S. 21, T. 17, R. 7 E.

The upper part of the variegated shales to the south-east of Cold Water Mountain, Calhoun county, extend for a short distance down into this county.

This formation forms also some of the flat piney woods south of Childersburg. Its variegated shales in the cuts of the C. & W. R. R. for some ½ mile south of Childersburg weather into variegated and mottled clays.

(d) *Coosa (Flatwoods) Shales and Limestones.* This formation, from 300 to 500 feet thick, makes a very poor showing in Talladega County. Its strata are badly covered up and are comparatively thin. They in places appear to be almost, if not entirely wanting. They occur in narrow strips along the south-east edges of the belts of underlying Cambrian strata. They do not cover over 25 square miles of the county. They make the greater part, at least, of the narrow *marble valley* along the north-west edge of the broken country of (a) Talladega [Ocoee] Slates to the south-west of Sycamore. The marbles of this portion of the valley are therefore of the strata of this formation. In this valley, near the county line on the south-west or in the N. W. ¼ of N. W. ¼ of S. 7, T. 22, R. 3 E., there is an outcropping in a mullatto and red loam of a beautiful white marble. Some 500 yards to the north-east, however, in a large outcropping at and near the Averett Spring, the strata are but very little metamorphosed or are for the most part nothing more than blue and gray limestones that in places on the weathered outcrops are rough and shaly. This outcropping extends over a considerable low flat area, partly covered with a growth of red cedar, and up the side of the hill above the spring for a heigth of some 75 feet. It appears to be comformable to and to dip under the hydro-mica shales to the south-east, capping the hill above the spring. Its uppermost or most south-east strata, those just under the hydro-mica shales or immediately along the fault appear to be the most crystalline or most metamorphosed.

The *marble valley* farther to the north-east, on the head waters of a branch of Cedar Creek between 2 and 3 miles south-west of Sylacauga, is a low flat valley a mile or more wide that is underlaid by marble, as is shown by outcrops and by borings. The well known *Gantt Quarry*, in the N. E. ¼ of N. E. ¼ of S. 2, T. 22, R. 3 E., is one of these outcrops. It is an open cut in a low place and when visited was full of water. The cut or quarry is said to be about 25 feet deep. The marble yards were near the quarry. Its rock is finely crystalline so far as can be seen. Much of it is a beautiful white marble. It appears to be freeer from joints and other flaws than the marbles of perhaps any other quarry in the county. This is doubtless partly due to its strata being not so badly weathered. It has along its bedded planes thin sheets of talcous shales. This quarry has not been worked for a great many years, though blocks of its pure white marble about 2 feet thick have been seen. Several of these blocks were on the east bank of the river at Old Fort William's Ferry.

The marble in the N. W. ¼ of N. W. ¼ of S. 1, T. 22, R. 3 E., is said to be covered by about 20 feet of loam and soil, as shown by borings. In an outcroping in the S. E. ¼ of S. 35, T. 21, R. 3 E., the marble is said to have been bored down into to a depth of 89 feet without getting through it. The dip here appears to be from 15 deg. to 20 deg. to the south-east.

Sylacauga is on the low or tapering off south-west end of a ridge that occurs along just to the north-west of the *marble valley*. This ridge however to the WSW., of Sylacauga for several miles is all broken up. A white marble is said to have been struck in wells at Sylacauga, under some 25 feet of deep red loam with some small loose rough nodules of milky quartz. To the south-east of Sylacauga, the broken country of hydro-mica shales is some 5 miles broad.

The "Herd Lower Marble *Quarry*" is on the south-east side of the *marble valley*, at the foot of the hills of hydro-mica shales in the N. E. ¼ of N. E. ¼ of S. 22, and W. ½ of N. W. ¼ of S. 23, T. 21, R. 4 E. Its marble is not of very good quality. Some of it carries irregular cherty streaks. It shows to a thickness of about 50 feet. The rocks of this quarry may belong at the bottom of the (e) Siliceous (Knox) Dolomite and Chert formation. The *marble valley* here is from ¼ to ½ mile broad. It is most probably entirely underlaid by a white marble, as this marble crops out in it in several places.

A pretty white marble crops out along Pace's Branch in the S. W. ¼ of N. E. ¼ of S. 1, T. 31, R. 4 E., as it flows from out of the broken country of hydro-mica shales. This marble in the bottom land along the creek is covered by from 4 to 7 feet of soil, as can be seen in the pits that have been sunk down on it. The *marble valley* here bends to the north-west and continues this direction to just beyond Sycamore before becoming about obliterated for several miles and again resuming its general north-east course, in a different formation. The Nix Marble Quarries are on the south-east edge of this narrow valley or on the edge of the broken country of hydro mica shales in the S. E. ¼ of S. W. ¼ and N. W. ¼ of S. W. ¼ of S. 36, T. 12, R. 4 E. The lower or south-east of these quarries shows some 45 feet in thickness of marble. The most of this marble, of bluish and grayish colors, is not however of very good quality. Some of it is a beautiful white granular rock like loaf sugar; some of it has a few green spots and streaks of talc; and some of it on the weathered outcrops is more or less shaly. It is cut up by joints. Its strata dip under a bluff of shiny, slick, curly, greenish hidro-mica shales just to the north-east of the quarry and appear to be conformable to the overlying thrust over hydro-mica shales. The dip is about 30 deg. to the north-east. The other *Nix Quarry* is about ¼ mile to the north-west. Its marble shows to a thickness of about 35 feet. Some of it is of good qulaity while some of it has cherty streaks. It also has a dip of about 30 deg. to the north-east, under the hydro-mica shales.

See analysis of outcrop 10 at the end of this chapter.

It may be said that the *marble valley* or the narrow valley along the great overthrust fault does not occur between Sycamore and Rendalia but that to the north-east of Rendalia to near the county line it is continuous and symmetrical. The marbles along the great thrust fault to the north-east of Sycamore are believed to be of the bottom strata of (e) Siliceous (Knox) Dolomite and Chert formation, with the exception of in one place, so far as known, that is several miles south-west of Ironaton or in the S. W. ¼ of S. E. ¼ of S. 33, T. 18, R. 6 E., where it is most probably of the (d) Coosa (Flatwoods) Shales and Limestones. This out-cropping is of an intermixture of marble and ordinary limestone, some of its rocks appearing to be only partly crystalline. The blue and banded marbles of some of the quarries to the north-east of Taylor's Mill may belong to the very top strata of this formation.

The strata of this formation have not been seen or identified in a single outcrop along the southeast edge of the belt of Cambrian strata including the Weewoka Mountains, but they have been seen in many outcrops along the south-east edge of the belt including the Alpine and Talladega Mountains. They are here mostly massive limestones of a blackish blue color, though some of the limestones are shaly and thin bedded. They have calcite streaks, interstratified argillaceous seams, and cherty sheets. Their weathered outcrops are often broken up into rhomboidal blocks and covered with a growth of red cedar. The rocks that have been quarried for fluxing purposes in the N. E. ¼ of S. W. ¼ of S. 1, and N. E. ¼ of S. 6, T. 19, R. 4 E. are along the dividing line between this and the overlying formation. The limestones in this formation are often covered by and are sometimes interstratified with, at their top, a yellowish shale with, in places, a greenish tinge.

These blue limestones at the top of the formation, weathered into thin flags in places, crop out in the eastern part of Talladega City.

This formation along the south-eastern edge of the Jackson Shoals strip have been seen as only an occasional rock.

It forms some of the flat piney woods to the south of Childersburg, cropping out as a banded blue limestone, called marble, in a low flat place in the S. E. ¼ of N. E. ¼ of S. 32, T. 20, R. 3 E. This outcrop has interstratified slaty seams and some of it a black bituminous look on a fresh surface

It may show also along the Coosa River in the bend below Chandler's Ferry.

(3) *Lower Silurian.* This group, from near 4000 to over 5000 feet thick, covers about 400 square miles of the surface area of Talladega County. It is made up of (f) *Pelham (Trenton) Limestones* and (e) *Siliceous (Knox) Dolomite and Chert.*

(e) *Siliceous (Knox) Dolomite and Chert.* This formation is the most important one in Talladega County, because both of its greater surface area and of its numerous limonite banks. It is from 3000 to 4000 feet thick and covers much more of the surface area of the county than all of the other formations combined or nearly 400 square miles, and carries some of the best limonite banks of the county. It can be divided into an upper subformation of chert ridges from cherty strata and a lower one of red lands of purer dolomites. The former is of irregular belts and tracts of a broken country with a general north-east and south-west trend, that are separated from each other by irregular belts and tracts of rolling lands of the latter. The soil of the former is commonly a poor gray siliceous soil that is but little in cultivation, while that of the latter is a very fertile deep red loam almost wholly in a state of cultivation. The native growth of the former is principally long leaf pine while that of the latter is principally of the hard woods, oaks, hickories, etc.

The repetition of the two sub-formations is due to unsymmetrical anticlinals and synclinals with overthrust faults along the steep north-west edges of the anticlinals or belts of the lower sub-formation cf red lands. The general dip of all the strata is therefore towards the south-east, though perhaps occasionally some of the steep strata on the north-west sides of the anticlinals are not engulfed in the faults. The faults are in gentle curves and often run into each other. It is in this way, with the help of denudation, that the belts of the two sub-formations are often lapped.

The fault along the north-west edge of this formation in the north-west corner of the county can be easily seen to be a great overthrust fault. Along it, in places, the strata of this formation are overlying those as high up as (6) Upper Sub-carboniferous, (i) Oxmoor Shales and Sandstones. The north-west edge of this formation, being of pushed over strata, is by no means a straight line. It strikes the Coosa River just below Lock No. 4 or on the western boundary of the S. W. ¼ of S. W. ¼ of S. 18, T. 16, R. 5 E. Many of its chert nodules and boulders have cavities that are lined with quartz crystals. Just to the south-east of it down next to the river, there is a broad elevated level field with some loose pieces of sandstones of a yellow ochreous color that may be of the underlying (2) Cambrian strata, (c) Montevallo (Variegated) Shales and Sandstones.

This formation in places is a piney woods country with a light siliceous soil that is almost free of rocks. These piney woods are sometimes low and flat, with numerous ponds and lime sinks. Their light siliceous soil, though it looks very barreny, will bring, so it is said, 25 bushels of corn or 1000 pounds of lint cotton to the acre. To bring such crops, it would doubtless have to be fertilized. Limonite, in considerable quantity, is said to occur in the piney woods, on a cherty ridge in the S. E. ¼ of S. 20, T. 16, R. 5 E. This ore, principally as gravels, occurs in considerable quantity on the knolls and low ridges of red land in the south-east corner of S. 16, T. 16, R. 5 E. These red lands have some boulders of spongy friable chalky chert, some big limestone springs, some large sinks, and many fine farms. They follow Blue Eye Creek, lying principally on its north side, from its head to its mouth.

A very irregular belt of cherty ridges set in a short distance south-east of Blue Eye Creek. In the northern edge of these cherty ridges, there is scattered over the surface in the south-east corner of S. 20, T. 16, R. 6 E., some limonite, and, just south-east of Lincoln, some sandstones and fine conglomerates. To the south-east of this belt of cherty ridges, there is one of the rolling red lands, known as the *Dry Valley*, that extends down from Old Easta Boga. To the south-west, the above belt of cherty ridges includes a considerable mountain with a small showing of limonite in the foot hills on its north-west side or in the south-east edge of the rolling red lands along Blue Eye Creek, in the southern part of S. 32, T. 16, R. 5 E.

Limonite, reported to be in considerable quantity, occurs in the cherty ridges to the south-west or in S's 11 & 12, T. 17, R. 4 E. This belt of cherty ridges on the south side of Choccolocco Creek, at Truss' Mill in the N. E. ¼ of S. E. ¼ of S. 12, T. 17, R. 4 E., is a broken country about 2 miles broad with a growth of long leaf pine. In the rolling and knobby red lands to the south-east of it, the extension to the south-west of the Dry Valley, there is a great deal of gravelly limonite. This gravelly ore, along with some nodular limonite, shows up well in the western part of S. 20 and eastern part of S. 19, T. 17, R. 5 E. These red lands here are not more than about a mile wide. To the south-east of them, there is a narrow belt of chert ridges with many outcrops of limonite. This ore, black and waxy and covered by from 6 to 8 feet of loam, is exposed to a depth of 3 to 4 feet in the bottom of a digging in the S. W. ¼ of N. W. ¼ of S. 29, T. 17, R. 5 E. The ore taken out appeared about sufficient to fill the digging, though there is but little other ore visible immediately around the diggings. The poor surface showing of ore here, as elsewhere on these cherty ridges, is due to the 6 to 8 feet cover of loam. The surface indications are merely occasional points of protruding boulders and some loose ferruginous sandy gravels. The country is a regular piney woods.

To the south-west, in the S. E. ¼ of N. E. ¼ of S. 30, T. 17, R. 5 E., there is a good showing of limonite in a digging. The ore here however extends to the surface and there is around the digging several outcrops of boulder ore.

Still farther to the south-west, about ¼ mile, in another digging, there is a good showing of boulder ore. This ore however has 4 to 5 feet of cover and so it makes a very poor surface showing. The rounded flint surface pebbles extend here down by the sides of the ore to a depth of 6 to 8 feet.

Still farther to the south-west, about a mile, there are other limonite digging. Some of these diggings make a good showing of ore, while others do not appear to have any surface ore at alls. There are hereabouts, away from the diggings, some few outcrops of rough or rocky boulder ore.

In the N. W. ¼ of S. W. ¼ of S. 31, T. 17, R. 5 E., there is a large deposit of gravelly and nodular limonite with some few small boulders. This ore is comparatively clean of all foreign matter and is of very good quality, as shown by the following analysis of a good average sample, dried an 100 deg. C :

Ferric Oxide	79.873
Silica	11.986
Phosphoric Acid	0.673

Analyst :—J. L. Beeson.

See also analysis of deposits 42 and 43 at the end of this chapter. The ores from these diggings are hauled over a narrow gauge railroad to the Ta. & C. V. R. R.

To the north-west of this last deposit for some 4 miles or to the Coosa River, there is a long leaf pine forest of fine timber. This timber is being rapidly cut down and in a few years will be a thing of the past. Its country is broken, or is made up of cherty ridges with many lime sinks. In one of the ridges in the southern part S. 34, T. 17, R. 4 E., there is a cave, called the *tripoli cave.*

This cave is in a grayish blue limestone with interstratified seams of almost pure chert. This chert on weathering or on the leaching out of its calcareous matter gives rise to the tripoli, of a yellow ochreous color. This tripoli has a harsh feel and appears to be of very good quality. Over the top or surface of this ridge, there is said to be a tripoli of a very different origin or an infusorial earth.

Limonite, in small quantity, occurs along the northwest edge of the cherty ridges in the N. E. ¼ of N. E. ¼ of S. 33, T. 17, R. 4 E. There are also some limonite beds to the south-west along the south-east edge of these ridges. These ridges, forming a belt from 1 to 5 miles broad, extend down the Coosa River, on the east side or in this county, for over 20 miles or to below Childersburg. Their long pines, with which they are in places thickly covered, are from 18 inches to 3 feet thick and from 40 to 80 feet without limbs. Along near the south-east edge or just to the south-east of this broken country of cherty ridges, there are numerous outcrops of limonite. This lead of ore appears to run about 1 mile north-west of Renfro. It shows an outcrop on the side of a hill in an old road in the N. E. ¼ of S. 33, T. 18, R. 4 E., where it is in large boulders and is of very good quality. It has been dug into in several places near Mr. J. M. Patterson's in the S. W. ¼ of S. 28, T. 18, R. 4 E. See analyses 49 and 50 at end of this chapter. Some of these pits yielded a good amount of ore, while others didn't strike any ore at all. The outcrop here is of large surface boulders. It is manganiferous. It shows as a few boulders of good ore along the road in the N. W. ¼ of S. E. ¼ of S. 32, T. 18, R. 4 E., and, still farther to the south-west, it makes numerous outcrops. Some of these outcrops on being dug into may lead to fine deposits of ore.

A fine body of ore (the Cook Beds) has been exposed in the N. E. ¼ of S. 12, T. 19, R. 3 E., though the surface indications were very poor. A branch railroad from the Ta. & C. V. R. R. will be built out to these mines. A good average sample of this ore, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	69.670
Silica	18.567
Phosphoric Acid	0.723

Analyst, J. L. Beeson.

See also analyses 51 and 52 at the end of this chapter.

Limonite occurs in both the N. E. ¼ and S. W. ¼ of S. E. ¼ of S. 24, T. 19, R. 3 E. In the latter *40*; there are some extensive diggings (W.E. Cook's Mines) into fine pockets of ore. This ore lies just on top or just south-east of a very large white clay-horse. It is mostly of dark brown and liver colors. Some little of it carries white cherty specks. This deposit has been connected by tram-road with E. T., V. & G. R. R. A good average sample of its ore, dried at 100 C., gave the following analysis:

Ferric Oxide	73.435
Silica	18.389
Phosphoric Acid	0 374

Analyst. J L. Beeson

See also analyses 54 and 55 at end of this chapter.

The State Geologist in his report for 1875 writes thus of the above broken country of cherty ridges:

"Turning westward within 4 to 5 miles of Talladega, without crossing the Talladega Hills, we find a broken country underlaid with chert all the way to Collins' Ferry on the Coosa River. One exception to this may be given in Howell's Cove, a very attractive valley, lying hemmed in on three sides by sterile hills.

"Where the chert prevails, as it does in the area under consideration, the characteristic features of this portion of the Dolomite (probably the upper part) are well seen. For 8 or 9 miles is a succession of hills or ridges covered with angular fragments of chert, and timbered with a growth of long leaf pine. Of other forms of vegetation, with the exception of asters and a few hardy plants, there is little to be seen. In the little valleys and frequently also upon the ridges, ledges of cherty dolomite crop out, and where calcareous rocks are not actually seen above ground, their presence may be inferred from the numerous lime-sinks which characterize this region. In one of these sinks in S. 34, T. 17, R. 4 E., ledges of a fine grained drab colored impure dolomite overhang the entrance of a cave, in which *tripoli* or fine white powdery silica, has been found; it is probably the residue from the decomposition of cherty dolomite. The rock which overhangs the cave has the characters of a good lithographic rock, though I do not know that any actual test of it has been made by the owner, Mr. Thos. A. Crook of Plantersville.

"Such a sterile soil has, of course, few attractions for the farmer and we find the country almost uninhabited, except along the banks of the streams which water it, and these are few in number.

"Further south-west a similar region in almost every respect is crossed by the road from Plantersville to Glover's Ferry.

"Three or four miles north of west of Plantersville is another occurrence of what has been called lithographic stone, on the land of Mrs. Stone.

"The cherty hills in this locality are not rugged and broken like some of those further north, but gently undulating, showing only occasional fragments of the characteristic chert.

"Along the crest of a hill some 100 to 150 feet above a wide open glade, the lithographic stone is exposed in ledges, striking N. 15 deg. E. and dipping 15 deg. south-east.

"Just above the upper ledge of the rock, and covering it with a sharp projecting comb, like that of a roof, is a thin stratum, 10 to 12 inches thich, of calcareous shale, which weathers dark brown. The limestone itself shows a thickness of 20 to 30 feet. Some of it is exceedingly fine grained and compact, and I should be much disappointed if it will not answer well as a lithographic stone. It will probably also answer well as a cement rock.

"The limestone seems to be quite free from pyrite; but the overlying shale is full of it.

"From the weathered surfaces of the limestone, project lenticular and cylindrical concretions of hornstone, and these, detached from the limestone in its disintegration, lie scattered about the slopes of the hill, and their curious shapes have attracted much attention, and given rise to many stories of the occurrence of fossil fish, etc., there.

"It is quite probable that the shales overlying the lithographic stone will, upon closer examination, be found to be fossiliferous.

"From the same formation, on Mrs. McKenzie's land, is another occurrence of lithographic stone, which has been thoroughly tested by experts, who have given very favorable reports. Unfortunately I missed seeing this locality and am able to give no information concerning it except at second hand. In Prof. Tuomy's time, this stone was known as a good hydraulic limestone.

"West of Mrs. Stone's quarry towards the river, the land is gently undulating, but apparently not fertile, the timber being chiefly long leaf pine, with little or no undergrowth.

"In S. 15, T. 19, R. 3 E., a chert ridge ends abruptly at what is known as the *Calhoun Mountain*. The summit of this little mountain is about 350 feet above the level of the Coosa River. The slopes of the hill are covered with fragments of the chert full of rhombohedral cavities caused by the removal of dolomite crystals. A ledge of dolomite about ¾ of the way to the summit has been burned for lime, but it is too siliceous to make a good lime. The strata strike nearly north-east and south-west, and dip south-east.

"The mountain is only about 2 miles long, the northern end of it gradually sinks down to the general level of the elevated rolling country mentioned just above.

"Near the foot of this mountain, in S. 21, T. 19, R. 3 E., is a large pond-spring, the source of a beautiful little creek, called Clear Creek, which flows into the river about 3 miles from its source, about 1 and ½ miles direct distance. A large mill (Frederick's) is located on Clear Creek a few hundred yards from its mouth. Below the mouth of the creek, at the ferry, a whitish cherty dolomite is exposed; it has been burned for lime, but like that from Calhoun Mountain, it is too siliceous.

"From this exposure it was difficult to ascertain the strike and dip, but the former seemed to be a little west of north, and the latter south of west at a high angle.

"Some 2 miles east of this, on Mr. Byar's land, a fine grained siliceous dolomite is again seen, with seams or layers of hornstone, The rock here lies nearly flat, and as a consequence the strike and dip were not easily determined. As well as could be ascertained, the limestone strikes north-east and south-west with a slight dip to north-west. If these directions are correct, it would show that the disturbance caused by the uplifting of the Potsdam Sandstone (the Talladega Hills, which terminate some 6 or 8 miles north-east) involved also these rocks. The siliceous dolomite under consideration has been pronounced a lithographic stone for which it may answer, if not too hard and too coarse grained. It is the property of Mr. James Burt, of Mardisville.

"From here towards Plantersville a succession of cherty ridges is crossed. At Mr. Cook's, 2 miles from the town, there is a limonite bank showing very good ore, and thence on to Plantersville, are many outcrops of the ore.

"In S. 19, T. 19, R. 4 E., near the residence of Col. E. R. Smith, the ore is seen in considerable quantities at the base of a little hillock composed of a porous ferruginous chert.

"In this neighborhood I noticed frequently that masses of friable porous chert were imbedded in the red clay of the low grounds, not being confined as usual to the ridges. Its rotten porous character accounts for this."

This porous chert is in the lower strata of the Knox Dolomite, in the red land rocks, and is quite different from that of the upper strata, the chert of the cherty ridges.

Limonite, in large quantity and of good quality, though mixed with some rough or rocky ore, occurs over a knoll in the S. E. ¼ of N. E. ¼ of S. 26, T. 19, R. 3 E., and along by the side of the road in the N. E. ¼ of S. E. ¼ of S. 26, T. 19, R. 3 E. It occurs farther to the south-west, in the N. W. ¼ of S. 3, T. 20, R. 3 E. (Bales Bank), as a hard compact siliceous ore mixed with rough or rocky ore and ferruginous sandstone. A good average sample of this ore, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	73.852
Silica	12.050
Phosphoric Acid	0.304

Analyst, J. L. Beeson.

This ore is in boulders and nodules of not the best quality and mixed with a good deal of chert makes a large deposit to the south-west, across Talladega Creek, on the Keith place about in the S. W. ¼ of S. 9, T. 20, R. 3 E. It was here so thick over the surface that it had to be piled up in heaps to enable the ground to be plowed. This ore makes a very good showing over the side of a ridge in the piney woods in the N. W. ¼ of N. E. ¼ of S. 2, T. 20, R. 3 E., though it is mixed with cherty nodules. Most of it is of good quality, though some of it is rough or rocky.

The *Mallory Cave* is in the chert ridges about in the S. E. ¼ of N. E. ¼ of S. 12, T. 20, R. 3 E. Its mouth is in cherty limestones, with chert and calcite streak down on the south-east side of a cherty ridge. The de scent into it is vertical for 12 to 14 feet and then ver steep for some 40 or 50 feet. The cave near its mouth i 40 to 50 feet high from floor to ceiling and 60 to 75 fee wide. It however soon divides up into three differen prongs from each of which there extends out smalle branches. One of these prongs can be followed, so it is said, for a mile. The ceiling and sides of the cave are studded with many beautiful stalagtites, some of which are at least 20 feet long. The stalagmites are not so numerous. On the floor, there are banks or heaps of very red plastic clay and a very peculiar fungus growth that resembles a spider web with guys extending out from a central point.

Limonite, of not very good quality, occurs over a knoll n the N. W. ¼ of S. W. ¼ of S. 19, T. 20, R. 4 E.

The *Singleton Limonite Deposits*, seemingly large deposits, in the N. ½ of S. W. ¼ of S. 20, T. 20, R. 3 E., overlie upper Cambrian strata perhaps, though their ore principally lump ore, is believed to have been derived from the lower strata of this formation. The ore of the most northern of these deposits shows up well, along a test trench, both as to the quantity and quality. A good average sample of this ore, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	75.049
Silica	13.782
Phosphoric Acid	0.963

Analyst:—J. L. Beeson.

The ore of the others of these deposits does not show up so well, either as to quantity or quality. It occurs along with loose pieces of quartzites and cherty rocks.

lso analysis of deposit 81 at the end of this chapter.
. Nitze, in speaking of the Singleton Mine, says:
e output is about 40 tons per day, working 7 hands.
e are 2 tons of ore to the cubic yard. The ore is
ed in ox carts about 2 miles to the A. & A. R. R.
re are about 40 acres of ore here. No surface indi-
ons of ore, but the indications of it in every pit on
place are excellent. It is undoubtedly an extensive
valuable deposit. The greatest depth yet attained
mining is about 10 feet, with solid ore in the bottom. I
ould estimate the probable thickness of the deposit to
about 30 feet, from the place that is now being worked
where the ore is cut into in a ditch below."

The dolomites near the bottom of this formation crop
ut in several places along near Tallaseehatchee Creek
the western part of S. 29, T. 20, R. 4 E. There is
id to be by Mr. H. B. C. Nitze in one of of these out-
ops up in a hollow, on the side of a bluff, a cave with a
ep spring that seems to be connected subterraneously
ith Tallaseehatchee Creek. A sample of this outcrop
ve the analysis of outcrop 4 at the end of the chapter.

The limestone outcrops along the big thrust fault on
e north side of the Kahatchee Mountains and their
tension around to near Sycamore must be of this for-
ation. One of these outcrops, some 60 feet thick, of a
uish rock, in the N. W. ¼ of S. 16, T. 21, R. 4. E., is
ite a pure rock as shown by its analysis of outcrop 5
the end of this chapter. This same rock shows at the
ontgomery Road Gap in the S. E. ¼ of S. 17, T. 21,
4 E.

Limonite is in seemingly quite a large deposit in the
outhern end of the cherty ridges south of Tallasee-
atchee Creek or around Mr. Garner's in S. 25, T. 20,
R. 3 E. This deposit in spots is a mere mass of ore
with some rounded flint pebbles.

The flat piney woods to the west to the foot of the Kahatchee Hills is some 4 miles wide from north-east to south-west and some 8 miles long from north-west to south-east. This flat country extends from the East Tennessee, Virginia, and Georgia Railroad to within a mile of the Anniston and Atlantic Railroad. It is underlaid principally by the lower strata of this formation, though Cambrian rocks form a portion of it. It has lime sinks and outcrops of cherty limestones and dolomites.

A white plastic clay that was dug down into to a depth of 35 feet, so said, was struck in a well in the S. E. ¼ of S. E. ¼ of S. 2, T. 21, R. 3 E. In this clay, at the bottom of the well, there are some beautiful specimens of halloysite.

Limonite, as a black waxy ore in boulders with stringy or fibrous slaty looking spots, crops out on some rather high ground in the S. W. ¼ of N. E. ¼ and N. W. ¼ of S. E. ¼ of S. 12, T. 21, R. 3 E. It has along with it a few fibrous slaty sandstones.

Limonite, in seemingly a large deposit, occurs on a long hill or short ridge in the S. W. ¼ of S. W. ¼ of S. 7 and N. W. ¼ of N. W. ¼ of S. 18, T. 21, R. 4 E. The ore of these two *forties* is quite different. That in S. 7, the more compact, is pebbly and is mixed with much more rough or rocky ore, though in places it is good both as to quantity and quality. That in S. 18 is in large quantity and in spongy boulders of good quality. It is so porous as to be of very light weight. It was shafted down into by mineral hunters in search of copper, having been taken for *copper gossan*. One of these shafts is said to be 40 feet deep and to show limonnite to its bottom. To the east of these deposits for several miles, the country is of broken cherty ridges with a growth of long leaf pine. Still farther east or south of Pope

Mountain, there are lime sinks and some occasional chert.

The cherty gray and blue limestones that crop out on the north side of the mountain at Oden's Mill, in the S.W. ¼ of S.W. ¼ of S. 18, T. 21, R., 3 E, and in other places, are believed to be of this formation just north of the thrust fault that occurs on the north side of the mountain and along which the Cambrain strata of the mountain have been thrust over on top of those of this formation to the north.

Limonite, in small quantity, has been exposed in some half dozen or more shallow test pits in the S. W. ¼ of N. E. ¼ of S. 13, T. 21, R. 3 E. This ore in most of the test pits is rough, rocky, or cherty, though in some of them it is a good porous ore of very light weight. Other test pits have been dug in the piney woods in the N. E. ¼ of N. E. ¼ of S. 12, T. 21, R. 3. E., and from them there was taken a rough cherty limonite, full of cavities lined with a white frosty incrustation of either quartz or *gibbsite*.

Marble Hill is a conical hill of gray limestone with an interstratified seam of white dolomite, in the piney woods in the S. ½ of S. W. ¼ of S. 2, T. 21, R. 3 E. The white dolomite might answer very well for a marble. It has been called *feldspar* by the neighborhood people. The dip here appears to be about 30 deg. to the north-west.

Lime sinks and chert occur along the public road in S's 11 and 12, T. 21, R. 3 E., and a gray limestone crops out around a big spring in the flat country in the S. W. ¼ of N. W. ¼ of S. 29, T. 20, R. 3 E. A gray limestone with a stringy or fibrous slaty structure on the weathered surfaces and with its stratification in knots or curls and waves, crops out at the east foot of the mountain or Kahatchee Hills in the N. E. ¼ of S. E ¼ S. 32, T. 20, R. 3 E. It is gashed over the weathered surfaces and has calcite streaks and interstratified seams of flinty cherty nodules or hornstone. The calcite streaks run in all directions. The rock splits easily with the stratification. The strike appears to be about east and west and the dip some 30 deg. to the north. It is surrounded by loose mountain rocks or quartzites. It is believed to be of the bottom part of this formation and to be just to the east of the fault along which the Cambrian strata of the mountain or Kahatchee Hills have been pushed on top of those of this formation. This limestone shows also some 200 yards to the south-east; on the side of a conical hill. The dip here appears to be to the north east. Loose quartzites occur also all around this outcropping. Limestones are reported to crop out and to have been burnt into lime in some flat lands a short distance to the south. They are most probably the same as those spoken of by the State Geologist in his report for 1875, page 170, as follows:

"Not far from Mr. Crumpler's house, in S. 5, T. 21, R. 3 E., there is an extensive outcrop of limestone, the property of Mr. Jno. Oden. It is a blue argillaceous banded limestone chiefly, but part of it is much purer. It strikes N. 10 deg. W. and dips about 35 deg. to the north-east. The strike is approximately paralled with that of a ridge of Potsdam Sandstone in the immediate vicinity, but the dip is just the reverse of the dip of the strata of the mountain. These limestones have a good deal the appearance of some of the strata of Chazy limestone seen in Shelby and Bibb.

"An other quarry in S. 32, T. 20, R. 3 E., shows a similar series of rocks, with some bands of black velvety hornstone.

"Lime has been burned from the stone of these quarries, and where properly selected a good article can be obtained. These localities are also near the railroad line mentioned."

A gray and blue banded limestone, called *black marble*, crops out in the edge of the low flat lands in the S. E. ¼ of N. E. ¼ of S. 32, T. 20, R. 3 E. It has interstratified slaty seams and some of it, on a fresh surface, a black bituminous look. Its strike appears to be about N. 15 deg. W. and its dip some 75 deg. to the west. It rather belongs at the top of the (d) Coosa (Flatwood) Shales and Limestones.

Lime sinks occur along the E. T. Va. & Ga. R. R. between Childersburg and Tallaseehatchee Creek. Chalky chert boulders and a friable red sandstone occur on the top of a ridge or spur about ¾ of a mile south-west of Childersburg. This spur, on the south butts up against the Kahatchee Hills or ridges of quartzite, from which it is separated by a fault. Massive cherty dolomites crop out on its west side, near its top, with a dip of about 30 deg. back into it or to the east. Flinty chert or hornstone, in loose boulders and nodules, occur both over and under this dolomite. Some of this hornstone is of a rose color.

A broken piney woods country of a red loam with an occasional chert nodule occurs between the Katala Mountains and the Coosa River as far to the south as the Haslet Spring Branch. Along this branch in the S. E. ¼ of S. E. ¼ of S. 17, and N. E. ¼ of N. E. ¼ of S. 20, T. 21, R. 2 E., there is a big outcropping of limestones that is believed to be of this formation, though it may be (f) Pelham (Trenton) Limestone. It has been burnt into lime, though it is too siliceous to make good lime or to be burnt wholly into lime. It must be in wrinkles or waves, as in one place it runs north-east and dips to the north-west, in an other place it is about level, and in still an other place it runs a little west of north and dips towards the east. South of this outcrop, there is some chert and sandstone to a broken piney woods country with chert nodules and rounded flint pebbles. At the southern foot of this broken country, along the Mardis Ferry road, there is some chert in a red loam. A cherty limestone with a great deal of calcite was blasted from Mr. G. W. Green's well in the N. E. ¼ of S. W. ¼ of S. 19, T. 21, R. 2 E. It may be that this limestone is of the (f) Pelham (Trenton) Limestones and that a part at least of the rolling country of red and mulatto loams with occasional boulders of chert between Mr. Green's and the ferry or river may be underlaid by these same limestones.

Knox Chert ledges of a sharp crested anticlinal cross the river just above the mouth of Cedar Creek and form a ridge that extends north-east up into this county about 1½ miles. A deep yellow ochre colored siliceus or cherty rock, as flagstones and boulders, occur at the north-west foot of this ridge near the center of the S. E. ¼ of S. E.¼ of S. 6, T. 22, R. 2 E. This rock has a metallic ring and is of light weight. Limonite in considerable quantity is said to occur along the south-east foot of this ridge in the S. W. ¼ of S. 5, T. 22, R. 2 E.

This formation to the south-east of the Alpine and Talladega Mountains is divided into two prongs as far to the north-east as south of Talladega, by the belt of Cambrian strata with the Weewoka Mountains.

The Ledbetter Limonite Banks are in the south-east prong, on a cherty ridge in the north-east corner of S. 14, T. 20, R. 4 E. These banks so far as can be seen, appear to be almost exhausted of ore. A great deal of ore has been taken from them. The ore of the south-west of these diggings is principally in small nodules and is of better quality than that of other or north-east digging where the ore is mostly in rough, rocky, or impure boulders. With this impure boulder ore, there is some loose chert and sandstone scattered over the surface. *White clay horses*, with small pieces of halloysite and thin clayey seams or streaks of a deep red color, occur in these banks. The ore is liver colored and mostly compact. Some little of it is porous. A good average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	75.708
Silica	14.268
Phosphoric Acid	0.598

Analyst:—J. L. Beeson.

See also analysis of deposit 78 at the end of this chapter.

To the north-east along the Talladega road, there is some little gravelly limonite in red loam.

The *Bowie Marble Quarry*, known also as the *Weewoka Marble Quarry* and as the *Herd Upper Marble Quarry*, is in the lower strata of this formation, along the great thrust fault or edge of the broken country of (a) Talladega (Ocoee) Slates, in the N. E. ¼ of N. W. ¼ of S. 18, T. 20, R. 5 E. Some of its marble is a beautiful translucent white, while some of it, not so beautiful, has in it streaks of flinty chert. Some of it is bluish and banded in color. Some of it has also sheets of greenish talcous slate. It is a fine grained dolomite. Its upper strata dip about 55 deg. to the south-east and its lower ones about 60 deg. to the south-east. An average sample of the strata exposed in the quarry, dried at 100 deg. C., gave the following analysis:

Carbonate of Lime........	68.38
Carbonate of Magnesia....	29.69
Silica....................	1.08

Analysis of outcrop 3 at the end of the chapter is also of this marble. It is used as a flux in the Jenifer or Alabama Furnace. The contractors get 45 cts. per ton for it, f. o. b. cars A. & A. R. R.

The following analysis, taken from Prof. Tuomy's Second Biennial Report, is said to be of a very beautiful snow white marble of fine close grain and presenting the hardness and features of finely crystalline pure carbonate of lime.

Carbonate of Lime.......	99.47
Carbonate of Magnesia...	0.38
Silica....................	trace.

It is said to be from the Herd's Upper Quarry, Talladega county, which is the same as the Bowie Quarry, though there is no resemblance whatever between the above analyses. The differance may be due to the latter one being of a picked sample of a single stratum.

Limonite (Flournoy and Welch Deposits) is to be seen in many places, on both the high grounds and low grounds, along a streak from 75 to 100 yards broad that extends through the S. E. ¼ and the N. E. ¼ of S. 7 up into the S. E. ¼ of S. 6, T. 20, R. 5 E. The ore in places appears to be in very large quantities or to make solid hills. It is mostly in boulders and nodules, though in places much of it is pebbly ore. Some of its boulders, especially, are rough, rocky, or impure ore. The ore is so thick in places over the surface that it had to be heaped up before the ground could be plowed. It is a black or dark colored ore and mostly compact. It is high in phosphorus as well as in metallic iron, as shown by the following analyses of good average samples, dried at 100 deg. C:

	(1)	(2)
Ferric Oxide	80.005	76.807
Silica	6.614	11.555
Phosphoric Acid	1.424	1.759

Analyst:—J. L. Beeson.

See also analysis of deposit 65, Maj. Fitzhugh's report, and the three analyses of deposit 2, Mr. Nitze's report, at the end of this chapter.

With this ore in spots, there are some rough nodules and pebbles of milky quartz from the (a) Talladega Slates just to the south-east.

Limonite in considerable quantity occurs in the red loam around the residence of the late Mrs. H. E. Reynold's in the N. E. ¼ of S. E. ¼ of S. 1, T. 20, R. 4 E.

The famous *Reynold and Whiting Limonite Bank* is in the northern part of S. 6, T. 20, R. 5 E., and the southern part of S. 31, T. 19, R. 5 E. This bank of ore is, to all appearances, a magnificent deposit of limonite that covers a square of about 4 *forties* or 160 acres. It is in a red loam from the disintegration of the lower strata of this formation. In the two southern *forties*, it is of a high hill that is uniformly covered with boulders, nodules, and pebbles of ore. This hill has been tested by shafts from 20 to 25 feet deep and in most of them the showing of ore is fine. White *clay-horses* were struck in the shafts and test pits with the best ore prospects. These deeper pits showed the ore, in places at least, to be underlaid by clay. The ore extends down to near the Anniston and Atlantic Railroad at the east foot of the hill and about 125 feet below its top. Some little of the ore has a slight shaly structure. On the north side of the above hill or in the northern part of the lower two *forties*, there is a shallow depression and then a low ridge over which the ore of the upper or northern two *forties* appears to be quite uniformly strewn for a few feet in depth, as far as tested. The ore of this bank, mostly small lump and wash ore, is partly compact and partly porous. Some little of it, with a black waxy look, is most probably high in phosphorus. An average sample of the whole depoit, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	72.949
Silica	9.700
Phosphoric Acid	0.388

Analyst:—J. L. Beeson.

Mr. H. B. C. Nitze, in his report on this ore deposit, says:

"General direction of deposit north-east and south-west. This is undoubtedly a remarkable deposit of ore. .... It abounds in knolls and little hills, on every one of which the surface indications show up excellently, the ground being literally covered with ore.... A great number of pits have been sunk on a little hill in the N. W. ¼ of N. E. ¼ of S. 6, T. 20, R. 5 E., and S. W. ¼ of S. E. ¼ of S. 31, T. 19, R. 5 E., sloping down to the A. & A. R. R. on the east. Most of these pits were put down vertically to a depth of from 20 to 30 feet. At the time of my visit, many were partly filled with rain-water, indicating a rather impervious soil. The shallower pits showed up solid ore on the bottom, and in the deeper ones a sort of yellow clay is seen to underlie the ore. The summit of this knoll above the level of the A. & A. R. R. track, as measured by aneroid barometer, is 120 feet. A vertical pit here, 12 feet deep, shows ore to its full depth, solid on the bottom. There are some 4 or 5 other pits around here that show up ore equally as well. On the northern slope of the hill, a cut has been made showing up solid ore, the greater proportion being lump ore. Barometer here registered 100 feet above the railroad track. Near this a vertical pit showed up the ore to a depth of 28 feet, barometer reading 120 feet above railroad. About 50 feet from here is another pit, near the township line between Reynolds and Whitings lands, thus:

Barometer reading	120 feet above railroad.
Depth of pit	22 feet.
Thickness of ore	15 feet.
Bottom of pit	Yellow clay.

"I should judge the average thickness of the ore, from the foregoing indications, to be about 20 feet.

"On the western and south-western slopes of this hill, there is a geat deal of gravel ore over the surface in the washed out gullies and a few pits that had been sunk, but no lump ore was seen. On the south-eastern slope, there are no indications of ore whatever, the surface being covered with sandstones. On the eastern slope, the ore shows up all the way down to the railroad.

Besides the above pits, there are quite a number on Whiting's land in S. 31, T. 19, R. 5 E., showing up the ore very well.

Analyses of deposits 71, 72, 73 and 74 at the end of this chapter are, according to Mr. Nitze, of an average from all of the pits of this ore deposit. The 3 analyses given of deposit 1, under Mr. Nitze's report, at the end of this chapter, are also of the ore of this deposit.

The *Carlton Limonite Bank*, in the N. E. ¼ of S. E. ¼ of S. 19, T. 19, R. 5 E., is along the edge of this formation. It most probably overlies upper (1) Cambrian strata, though its ore is believed to have come from the lower strata of this formation. The ore is mostly porous and of good quality. It is just to the south-east of a large white *clay-horse*. It is covered by from 4 to 5 feet of red loam with but very little ore and hence its surface indications, of only a little gravelly sandy ore, are very poor. The ore is mostly liver colored. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	88.692
Silica	9.951
Phosphoric Acid	0.514

Analyst, J. L. Beeson.

Within ½ mile of the above bank, there is said to be several other limonite banks that are connected with the chutes by narrow gauge railroads. These deposits must be very extensive, as a well is said to have been dug 120 feet down into the ore without getting through it. The two analyses of deposit 70 at the end of the chapter are also of this ore. There are also some extensive deposits of white clay along with these limonite deposits.

The limonite banks in the north-west foot hills of the Mallory Mountain, described under (b) Weisner (Chilhowee) Sandstones, may also be partly of this formation. Limonite diggings occur to the north of these banks or in the piney woods in the N. ½ of S. ½ and S. ½ of N. ½ of S. 4, T. 20, R. 4 E. The ore of these old diggings is all in pebbles and small nodules. It is mostly of good quality, though in spots some of it is rocky or impure. The only other visible rocks around these diggings, in flat piney woods, are occasional nodules and small boulders of chert. The ore is liver colored and partly compact and partly porous. It is high in phosphorus, as is shown by the following analysis of an average sample, dried at 100 deg. C.:

Ferric Oxide	69.897
Silica	17.709
Phosphoric Acid	1.753

Analyst, J. L. Beeson.

See analysis of deposit 5, Mr. Nitze's report, at the end of this chapter.

Limonite, though mostly rocky or impure, occurs in places on some low ridges and knolls, with a growth of principally black jacks, in the piney woods in the S. E. ¼ of S. 32, T. 19, R. 4 E. It is in boulders, as well as nodules and pebbles. It makes a good showing in a digging in the edge or bottom strata of this formation, in the S. W. ¼ of S. E. ¼ of S. 32, T. 19, R. 4 E. This digging must have been almost wholly in ore, as very little residual matter is left. Its ore is mostly good.

The blue limestone at the bottom of this formation or top of the (d) Coosa (Flatwood) Shales and Limestones was quarried in an outcropping in the N. W. ¼ of N. E. ¼ of S. 27, T. 19, R. 4 E. and used for building culverts, etc., along the E. T., Va. & Ga. R. R. A similar blue limestone crops out along Talladega Creek in this same forty.

Limonite has been dug for in a half-dozen or more pits in a broken country of cherty ridges in the N. W. ¼ of S. 23, T. 19, R. 4 E. (Webb's Bank). It was struck in considerable quantity in some of these pits, though it is rocky or cherty and is mixed with chert. The best of it, that farthest west, shows only as scattering nodules and pebbles over the surface. It is mostly liver colored, though some of it is a dark color. A good average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Acid	63.725
Silica	24.320
Phosphoric Acid	0.416

Analyst, J. L. Beeson.

See also analysis of deposit 68, Maj. Fitzhugh's report, and deposit 3 of Mr. Nitze's report, at the end of this chapter.

Limonite is in large quantity, in boulders, nodules, and pebbles, in the E. ½ of S. E. ¼ of S. 13, T. 19, R, 4 E. and W. ½ of S. W. ¼ of S. 18, T. 19, R. 5 E. [Mrs. Hancock's]. It was so thick over the surface that it had to be heaped up to enable the ground to be plowed. It is a hard compact ore of liver, dark and reddish brown colors. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	67.153
Silica	13.853
Phosphoric Acid	0.751

Analyst, J. L. Beeson.

The gravelly limonite, with some small nodules and a few large boulders of ore, about ½ mile south of Mardisville, spoken of under [c] Montevallo [Variegated] Shales and Sandstones, most probably came from the bottom strata of this formation.

A beautiful rolling country of red loam over the lower rocks of this formation occurs along the road between Mardisville and Talladega. Some of the lower of these rocks, of an ashy gray color on the weathered surfaces, with interstratified seams of bluish hornstone, crop out as ledges in the western and eastern parts of Mardisville. In the red loam over these rocks, there is some pebbly limonite. Outcrops of cherty limestone just north of Mardisville have a north-west strike and a dip of about 30 deg. to the north-east. Limonite, in considerable quantity, is scattered over the surface around these outcrops.

Limonite, in nodules and pebbles of good quality, occur on a knoll on the north west edge or over the bottom strata of this formation in the S. W. ¼ of N. W. ¼ of S. 14, T. 19, R. 4 E.

The *Miles' Quarry* in the N. E. ¼ of S. W. ¼ of S. 1, T. 19, R. 4 E., is in the deep blue limestone at the bottom or just under the bottom strata of this formation. It shows in the quarry a thickness of 75 to 100 feet. It has also been quarried for fluxing and building purposes on the south bank of Talladega Creek in the N. E. ¼ of S. W. ¼ of S. 6, T. 19, R. 5 E. It is covered in places by a siliceous gray limestone and in other places by a yellowish shale with some bluish gray calcareous sandstones at its top. Analysis of outcrop 6 at the end of this chapter is of this dolomite.

Limonite in large quantity is to be found in the cherty ridges, to the south of Talladega Creek, in the N. W. ¼ of S. 16 and N. E. ¼ of S. W. ¼ of S. 16, T. 19, R. 5 E. It makes a very good surface showing, except n the northern part of the deposit, though the surface ore in places is badly mixed with chert nodules and ounded flint pebbles. The deposit is of spots or pockets f ore without any ore between these spots or pockets o far as can be seen on the surface. The ore is in boulders, nodules, and pebbles, and in places is mostly a pot ore. It is compact and cellular and mostly of a liver color. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	79.432
Silica	8.962
Phosphoric Acid	0.439

See also analysis of deposit 64 at the end of this chapter.

These cherty ridges extend westward to within about 100 yards of the Annsiton and Atlantic Railroad to where the red land sets in and continues on to Mardisville. This red land covers the bottom strata of this formation and along its center a narrow streak of Cambrian strata. It carries some pebbly limonite.

A hard rocky or cherty halloysite was shafted down into in the cherty ridges in the S. E. ¼ of S. 17, T. 19, R. 5 E. These cherty ridges are soon supplanted on the south by a flat piney woods with lime sinks and without any rocks over the surface. Farther east, however, in S. 21, T. 19, R. 5 E., these piney woods have cherty ridges with over their surfaces loose nodules of milky quartz and of limonite with white quartz streaks. These ridges have over them also some loose white calcareous sandstones and an occasional hornstone boulder.

To the north-east, along Talladega Creek, the country is very broken. A banded limestone of intersratified thin seams of hard pure blue limestone and of a softer argillaceous gray limestone, crops out along the road south of the creek at Burk's Mill. The banded appearance is most plainly seen in the weathered outcrops, where the argillaceous seams are dirty, clayey looking, and where the hard blue seams often occur as loose thin slabs over the surface. These rocks belong at the very bottom of this formation or the top of (d) Coosa (Flatwood) Shales and Limestones.

Limonite, as boulder ore, is said to be in large quantity in the S. W ¼ of 15, T. 19, R. 5 E. It is also said to be in the northern half of this same section. The chert in the red loam along the road just north of the creek at Burk's Mill is partly a yellowish ochreous color and partly pinkish. Farther north, there is a great deal of gravelly limonite, principally in spots.

The *Weisinger Limonite Banks* are in a hill or ridge just to the east of the road in the S. E. ¼ of S. E. ¼ of S. 3, T. 19, R. 5 E. They are connected with the Talladega Furnace, 2½ miles distant, by a narrow gauge railroad. Their hill or ridge as seen from the road appears to be full of chert, though on top, around the ore diggings, it does not appear to have much chert. It has on its top an occasional protruding limonite boulder and some sandstones and halloysite rocks. Its surface showing of ore however is poor, though the diggings have made a fine yield of ore. The ore is in red and brown loams, and but little of it occurs within 4 to 5 feet of the surface. This accounts for the little surface ore. The ore is mostly in small nodules, the boulders being few. All that passes though the screen is left in debris. It is mostly a compact liver colored ore. It does not appear to be of the best quality, and this is shown to be the case by the following analysis of a good average sample, dried at 100 deg. C:

Ferric Oxide	68.702
Silica	19.516
Phosphoric Acid	0.501

Analyst, J. L. Beeson.

See also analysis of deposit 63 at the end of this chapter.

Limonite, in cosiderable quantity, occurs loose over the surface around Mrs. J. H. Willman's residence in the S. W. ¼ of S. 2, T. 19, R. 5 E. It makes a good showing in some diggings in the N. W. ¼ of S. E. ¼ of S. 2, T. 19, R. 5 E., though the only surface indications here are an occasional protruding point of a burried boulder. This boulder ore makes some outcrops between these diggings and Mrs. Willman's, though it is in loose chert and is for the most part rocky or siliceous.

More or less pebbly limonite and a yellow ochreous chert occurs in the red loam along the road for over a mile north of the Weisinger Limonite Banks. This rotten or leached chert is in places a very good *tripoli*.

"*Sand Mountain*" is a high point of dolomites in the cherty ridges in the N. E. ¼ of S. 11, T. 19, R. 5 E. The dolomites extend from its foot to its top, nearly 150 feet high. Some of these dolomites are very sandy while others are quite pure. Some of the very sandy ones, near the foot of the mountain, have weathered into beds of a fine white sand, hence the name, *Sand Mountain*. The purer ones have been burnt into lime. See analysis of outcrop 7 at the end of this chapter.

The several marble quarries, to the north-east of Taylor's Mill, the Leak Lower Quarry in N. E. ¼ of S. E. ¼ of S. 12, T. 19, R. 5 E.; the Leak Upper Quarry in the S. W. ¼ of N. W. ¼ of S. 7, T. 19, R. 5 E.; the McKenzie Quarry in the S. E. ¼ of N. W. of S. 7, T. 19, R. 6 E.; and the Cameron Quarry in the N. W. ¼ of S. W. ¼ of S. 8, T. 19, R. 6 E., along the eastern edge of the broken country of cherty ridges, are believed to be principally of the bottom strata of this formation, though some of their strata may of the top strata of the (d) Coosa (Flatwood) Shales and Limestones. These quarries, unlike those to the south-west of Taylor's Mill, are on the north-west side of the *marble valley* or narrow valley along the great thrust fault. The fault, however, along here is in the valley, near its north-west edge, whereas to the south-west it is along the south-east edge of the narrow valley.

The Leak Lower Quarry is principally in a blue marble, though some of its marble is banded with blue and white seams and some of it is wholly white. The most of its marble is a closed grained pure rock with a metallic ring that takes a good polish. Much of it, however, on the weathered surfaces, is somewhat shaly, and some of it is cut up by joints and some of it has thin cherty streaks. It gradually passes, near the west end of the quarry, into an ordinary blue limestone with joints, that splits into large flags of uniform thickness. The marbles of this exposure, about 75 yards in length, are in places in waves and in other places are contorted. It is said that blocks 4 feet thick by 8 feet wide have been gotten here. The following analyses by Prof. W. C. Stubbs, from the Geological Report for 1874, are of both the blue and white varieties of this quarry:

Analyses:	(1)	(2)
Specific Gravity...........	2.68	2.70
Calcic Carbonate..........	95.25%	94.40%
Magnesic Carbonate.......	0.62%	0.41%
Ferric Oxide and Alumina	*1.15%	†0.75%
Silica	2.95%	4.65%
Total	97.99%	99.21%

*Chiefly alumina. †Chiefly ferric oxide.

(1) A white marble that dissolves readily in acid. Locality:—Taylor's Mill, Talladega county.

(2) A blue marble that dissolves readily in acid. Loality:—Taylor's Mill, Talladega county.

See also analysis of outcrop 11 at the end of this chapter.

The marbles of the above quarry, though they are along the south-east edge of this formation, look both in their general appearance and in their analyses as if they belonged at the top of the (d) Coosa (Flatwood) Shales and Limestones.

The McKenzie Quarry is said to be also principally in a blue marble, though some of its marble is white. Two diamond drill holes are said to have been bored 100 feet deep into the marble of this quarry without getting through it.

The dolomite at the bottom of this formation are said to have been quarried some for fluxing purposes in the southern edge of Talladega city.

Limonite, as gravels and an occasional boulder, occurs in considerable quanity in the red loam in the eastern edge of Talladega, bordering on the piney woods or cherty ridges. It has along with it some rounded flint pebbles. It occurs also out in the piney woods, among the cherty ridges. See analysis of deposit 85 at the end of this chapter.

An old limonite digging on the side of a hill in the N. W. ¼ of N. W. ¼ of S. 34, T. 18, R. 6 E., does not show much ore, nor is there much visible ore around it, though it is said to have made a fine yield of ore. Gravelly ore makes a fine surface showing lower down the hill. This hill is now covered with a growth of black-jacks, though its original growth was long leaf pine.

A large deposit of impure limonite in boulders, nodules, and gravels, occurs across a narrow valley to the south-east of the above hill or in the N. ½ of S. W. ¼ and N. W. ¼ of S. E. ¼ of S. 33, T. 18, R 6 E. Some of this ore has specks and streaks of milky quartz. It occurs along with a quartzite or cherty sandstone, in nodules, of a dull yellowish color. Limonite lies scattered in considerable quantity, in boulders and nodules of good quality, over the side of a hill in the S. E. ¼ of S. W. ¼ of S. 27, T. 18, R. 6 E., and in large quantity of impure or rocky boulders on a hill, covered with long leaf pine, in the S. W. ¼ of S. E. ¼ of S. 27, T. 18, The *Jones' Limonite Bank*, in the S. W. ¼ of N. W. ¼ S. 34, T. 18, R. 6 E., appears to be an immense deposit of ore, in boulders, nodules, and pebbles. It looks almost like one solid bouler of ore for some 200 yards on the outcrop. It is principally a black or dark brown compact ore, that is high in both iron and phosphorus, though some of it is rocky or impure. A good average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	76.158
Silica	10.485
Phosphoric Acid	1.249

Analyst, J. L. Beeson.

See also analysis of deposit 92 at the end of this chapter.

Limonite occurs in pockets at short intervals, in a broken high ridge of red loam, all the way from the above bank to beyond Ironaton, a distance of some 3 miles. It is however more highly developed in places than in others or some of the pockets are larger than others. The short intervening spaces between the pockets usually carry more or less ore, though, in a few instances, they are seemingly barren of ore. This ore has been dug into in many places, under the names of almost as many different banks or mines as there are known pockets of ore. The mines are on the steep eastern slope of the ridge. In some of the mines merely the boulder and nodular ore is saved, being picked out by hand; in others the gravelly ore is also saved, by screening; and in still others the finer ore is secured, by washing. The washed ore is usually roasted at the furnace. Formerly, the more southern of these deposits were collectively known as the *Seay Bank* and the more northern ones as the *Irona Bank*, now they are known as the Hurst, Pace, Leunard, Washer No. 2, Logan, Washer No. 4, Washe No. 3, Old Tram No. 1, etc. Their ores have been used in the furnaces for a long time. The following complete analyses of average samples of them are taken from the State Geologist's Report for 1875:

	(1)	(2)
Combined Water	11.86	11.52
Siliceous Matter, insoluble	7.39	11.62
Soluble Silica	0.19	0.09
Ferric Oxide	77.54	68.93
Alumina	2.07	3.59
Lime	0.07	0.10
Magnesia	0.03	0.05
Manganese	——	3.77
Phosphoric Acid	0.29	0.13
Sulphur	None	None
Undetermined and loss	0 56*	0.20
Total	100.00	100.00
Metallic Iron	54.28	48.25
Phosphorus	0.13	0.06

(1) Ore from the Seay Bank. * Includes the manganese.

(2) Ore from the Irona Bank.

The above report gives also the following as an analysis of the forged iron from the ore of the Irona Bank:

Metallic Iron	99.020
Carbon	0.198
Silicon	0.265
Sulphur	0.000
Phosphorus	0.122
Manganese	0.064
Undertermined and loss	0.331
	100.000

These limonite deposits, over the bottom strata of s formation and partly perhaps over the top strata of underlying formation, are along the south-east edge a broken country of cherty ridges, and are separated m a still more broken country on the south-east, of Talladega (Ocoee) Slates, by a narrow valley of iegated shales that are believed to be (c) Montevallo ariegated] Shales more or less metamorphosed. It y be that the red loam, etc., of the ore banks cover great thrust fault and that the variegated shales of narrow valley are of the [a] Talladega [Ocoee] tes.

n the north-western edge of this narrow valley, on side of a ridge in the N. W. ¼ of S. W. ¼ of S. 34, 18, R. 6 E., there is considerable honey-comb ore. short distance to the north-east, there are several old ggings with good showings of limonite.

The *Hurst Limonite Banks*, a little farther east, are o in number. These two banks, though not over 25 rds apart, and one only a little higher up the hill an the other, have very different ores. The ore of the per bank is in large boulders and is a little slaty with ne white flinty streaks, while that of the lower bank, ugh also a little slaty, is nodular, of very light ight, and often a pot ore. The ores of these two banks n a red loam and looks as if it might be of or that it ght follow the strike and dip of three different sets of ata. That of the lower bank and of the most south-t strata, along near the south-east foot of the ridge, believed to be really the bottom ore, geologically, shed over towards the north-west until now it is on . It is a spongy or porous ore of very light weight, d is from 12 to 15 feet thick. It is separated from ore of the next or middle strata by a white clay-se from 30 to 40 feet thick. This middle ore is hard and compact and usually thicker than that just mentioned. It also has a white *clay-horse* between it and the next ore which is believed to be, geologically, the top ore turned over with the other strata towards the north-west until it is now at the bottom. In following these ores to the north-east, the dividing *clay horses* would likely disappear in places and in still other places they might thicken or be multiplied. These ores are very high in phosphorus. An average sample of them, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	63.683
Silica	22.344
Phosphoric Acid	1.788

Analyst:—J. L. Beeson.

The *Pace Limonite Banks*, in the north-east corner of N. W. ¼ of S. E. ¼ of S. 34, T. 18, R. 6 E., are but a short distance east of the Hurst Banks. The ore of the upper of these banks, on Sept. 3, 1893, showed a face about 4 feet thick. This ore was covered by from 10 to 12 feet of loam with loose rocks. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	68.640
Silica	16.100
Phosphoric Acid	0.384

Analysis:-J. L. Beeson.

The *Lennard Limonite Bank*, still farther east, is in the N. W. ¼ of S. W. ¼ of S. 35, T. 18, R. 6 E. This bank serves to show what a diversity of ore and rock may be in one and the same digging. It has a mixture of soft porous ore of light weight, of hard compact heavy rocky or impure ore, and of ferruginous sandstones. It has also a massive dolomite with prominent cherty streaks and hacks over its weathered surfaces. The ore is very high in phosphorus. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	66.382
Silica	20.466
Phosphoric Acid	2.007

Analyst, J. L. Beeson.

See also analysis of deposit 93 at the end of this chapter.

A cellular limonite of very fine quality occurs in some diggings in the next *forty* to the east. This ore, dried at 100 deg. C., gave the following analysis.

Ferric Oxide	82.750
Silica	6.190
Phosphoric Acid	0.785

Analyist:—J. L. Beeson.

In an outcropping of Knox Dolomite in the cherty ridges in the S. E. ¼ of S. E. ¼ of S. 27, T. 18, R. 6 E. there is an old quarry. This dolomite, on the weathered surfaces, has a siliceous look, though it is said to burn into good lime and to have been used for 6 months and more as a flux in the Ironaton Furnace. It shows a thickness of about 30 feet in the quarry.

To the east of the above old quarry, there are some high conical hills with down on their sides outcrops of hard gray limestones and over their tops loose boulders of compact flinty chert or hornstone. The limestones weather into thin sheets and the hornstone into small scales. One of these hills is called the *Gun-flint Mountain*, from piles of chippings of gun flints and flint arrow heads on it.

The *Logan Limonite Bank* is on the east end of a low ridge between the Gun-flint Mountain and the Washer Limonite Bank No. 4. It has considerable *pyrolusite.* Its limonite is similar to that of the Washer Bank No. 4.

The *Washer Limonite Bank No, 4,* about ¼ mile west of Ironaton, showed a fine exposure of ore on Sept. 4, 1889. Its ore, principally compact and of a black color, is covered by from 10 to 15 feet of *float* or loam with loose surface rock. This float, here as elsewhere, is almost barren of ore, with at best only some nodular and pebbly ore along with the other loose rocks. It varies in thickness from 0 to 15 feet. The ores of the last two banks are very high in phosphorus, as shown by the following analyses:

	(1)	(2)
Ferric Oxide	73.788	66.074
Silica	8.660	16.860
Phosphoric Acid	1.712	2.065

Analyst:—J. L. Beeson.

[1] Loose pieces from roadside near the Logan Limonite Bank.

[2] Compact and cellular ore. Average sample of the Washer Bank No. 4 ore.

The *Washer Limonite Bank No. 2,* at Ironaton, carries its ore in pockets in red and yellow loams, principally in red loam. The ore pockets are often surrounded by a black smutty powder of *pyrolusite.* The limonite is mostly spongy, though some of it is solid and compact. Some of it is stalactitic. Yellow and white *clay-horses* occur in this bank. The former carry no ore, while the latter have some boulder ore. This bank did not have a good showing of ore on Sept. 4, 1889.

See analysis of deposit 94 at the end of this chapter.

The *Washer Limonite Bank No. 3,* the next bank to the north-east, had however a fine showing of ore, in a red loam on the north and south sides of a yellow clay-horse. Its ore is webby or spongy. Its float ore, pebbly ore in considerable quantity, extends down to a depth of 15 feet below the surface. The ore of the eastern edges of the last two banks, next to the narrow valley between them and the broken country of (a) Talladega (Ocoee) Slates, has along with it some semi-talcous slates, metamorphosed, believed to be (c) Montevallo (Variagated) Shales or the shales of the narrow valley. It may therefore be that some of these ores overlie the top of the (c) Montevallo (Variegated) Shales rather than the bottom strata of this formation, though it is rather thought that these shales have merely been pushed over towards the north-west on top of the lower strata of this formation.

The *Old Tram No. 1 Bank*, about ¼ mile north of Ironaton, had a fine showing of ore on Sept. 4, 1889. Its ore is under a white *clay-horse* and is in interstratified layers that are in waves with an east and west trend. It is a stalactitic honey-comb and pot ore with black velvety surfaces. Much of it is a beautiful ore, well suited for cabinet specimens. A good average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	75.172
Silica	12.469
Manganese	1.896
Phosphoric Acid	0.459

Analyst—J. L. Beeson.

See also analysis of deposit 95 at the end of this chapter.

Cherty ridges form a broken country for some 4 miles to the north-west of Ironaton. In it, there are numerous pockets of pebbly and nodular limonite. A limonite deposit was exposed on the eastern edge of this broken country, about 1 mile north of Ironaton, in digging down the side of a low ridge for a wagon road and for the Anniston and Atlantic Railroad.

The *Dye Limonite Bank*, two deep cuts, is on the edge of this broken country in the S. E. ¼ of S. 23, T. 18, R. 6 E. Its ore, principally lump, is high in both iron and phosphorus. It is principally of a webby or spongy character and is in red and mulatto loams. It comes to the surface in places, though as a general thing it is covered by from 8 to 12 feet of a sandy loam without any ore. The fine ore is screened. An average sample of the ore of this bank, dried at 100 deg C., gave the following analysis:

Ferric Oxide	72.726
Silica	11.269
Phosphoric Acid	1.304

Analyst:—J. L. Beeson.

See also analysis of deposit 96 at the end of this chapter.

The limonite of the knolls along Cheawha Creek in the N. W. ¼ of S. E. ¼ of S. 13 and S. E. ¼ of N. E. ¼ of S. 14, T. 18, R. 16 E., may be of this formation, though they are believed to overlie (c) Montevallo (Variegated) Shales and Sandstones under which they have been described.

Numerous lime sinks occur in the cherty ridges along the McElderry and Taliadega wagon road.

The *Curry or Fox Limonite Bank* is in these ridges about in the S. W. ¼ of S. 2, T. 18, R. 6 E. The ore here does not show much on the surface. It however sets in from 18 inches to 2 feet below the surface and forms a considerable deposit. It has among it some boulders of a yellow ochreous sandy chert. It is mostly a compact liver colored ore. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	75.803
Silica	15.908
Phosphoric Acid	0.593

Analyst:—J. L. Beeson.

The *Parker Mines* are in S. 36, T. 17, R. 6 E. See analysis of deposit 98 at the end of this chapter.

There is a great deal of pebbly limonite in the red loam along the north-west edge of this broken country of cherty ridges. This pebbly ore is mostly smoothly water worn and of a black color. The red loam from the bottom strata of this formation makes the *Pond Spring Valley*, a beautiful fertile valley that extends from Curry's Station to Talladega. There is a great deal of pebbly limonite also along the north-west edge of these red lands, next to the hills and ridges of (c) Montevallo (Variegated) Shales and Sandstones.

The outcrops of impure dolomites and limestones along Dry Creek, some 200 yards south of Curry's Station, are covered with a growth of red cedar. Their dip is about 60 deg. to the north-west, which would indicate that they are in great waves with a north-east and south-west trend. They form along Cheawha Creek, below the ford, a flat country with lime sinks and a growth of red cedar. At Mr. Shank Jemison's Mill, on Kelly's Creek in the N. W. ¼ of N. W. ¼ of S. 33, T. 17, R. 6 E., they are on the north side of an anticlinal and have a dip of about 50 deg. to the north.

Limonite, in sandy boulders and in large quantity, is said to occur on a chert ridge in the S. E. ¼ of N. E. ¼ of S. 28, T. 17, R. 16 E. This boulder ore, with some good nodular ore, makes a considerable deposit on the same ridge in the S. W. ¼ of N. W. ¼ of S. 27, T. 17, R. 6 E.

Limonite, as pebbles and a few nodules, makes a considerable deposit on a red knoll in the S. W. ¼ of S. W. ¼ of S. 22, T. 17, R. 6. E. It occurs on all the knolls for over a mile to the east and north-east of here.

The small deposits of spongy limonite of very good quality that occur in the broken piney woods in S. 4, T. 18, R. 5 E, and S. 33, T. 17, R. 5 E., spoken of under the Jackson Shoals' belt of (c) Montevallo (Variegated) Shales and Sandstones, most probably have come from the lower strata of this formation.

The *Poor House Limonite Deposit* near the foot of the north side of the Talladega Hills, north of Tálladega, described under (b) Weisner (Chilhowee) Sandstones, may be of the lower strata of this formation at the south-west end of a cherty ridge as it butts up against a fault and the Talladega Hills at a considerable angle. This deposit is in a red loam along the fault. The fault is an underthrust one along which the strata of the Talladega Hills are pushed over on those of this formation to the north-west.

Some considerable deposits of limonite occur along the north-west edge of the broken country of cherty ridges next to the (c) Montevallo (Variegated) Shales and Sandstones of the Jackson Shoals' belt. They most probably belong to the bottom strata of this formation. One of them is in the red knoll of several acres in extent on which Dr. Barleton's residence stands in the N. E. ¼ of S. W. ¼ of S. 23, T. 17, R. 5 E. Its ore is of good quality. It is in nodules and pebbles, compact, and of dark brown and liver colors. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	89.540
Silica	3.916
Phosphoric Acid	0.394

Analyst—J. L. Beeson.

A low flat piney woods country, underlaid by a deep blue limestone at the bottom of this formation, occurs in places just to the north-west of the Talladega Hills. This rock on the weathered surfaces is of an ashy gray color and is hacked. It has, in places, irregular interstratified clayey looking streaks that, on the weathered surfaces, are of a dirty yellow color, and are more or less shaly. They have some calcite spots and, in places, a great deal of black flinty chert or hornstone. They have over them in places, or there is in these flat piney woods in places, some low knolls and short ridges of a honeycomb chert, that is mostly black and compact, though it is sometimes calcareous and of a gray color. This flat country extends to within a mile of Turner's Mill or to a cherty ridge with, at its north-east end next to Cheawha Creek, a flinty chert or quartzite, in nodules and boulders, and milky quartz in angular nodules and gravels. The former doubtless gave rise to the latter on weathering, as they have spots and splotches of milky quartz. They also have cubical cavities and are very hard.

Dolomites and limestones, with some very cherty and some very pure strata, form the bed of Cheawha Creek just below Turner's Mill dam. They are said to extend down the creek about a mile and up the creek about ½ mile to where they are reported to form a regular mountain.

A beautiful slightly rolling country extends from Turner's Mill to Easta Boga. It is, to the north of Choccolocco Creek, of fertile red lands with some outcrops of white chalky chert and of cherty blue limestones. These red lands have also some considerable deposits of gravelly limonite, as in the S. E. ¼ of S. W. ¼ of S. 11, and S. W. ¼ of S. 1, T. 17, R. 5 E., and with some nodular ore, just east of Old Easta Boga or in the N. W. ¼ of S. 4, T. 17, R. 6 E. They also have some lime sinks.

Limonite banks are said to be in the cherty ridges in the N. E. ¼ of N. W. ¼ of S. 4, T. 17, R. 6 E. These cherty ridges set in about ¾ mile south-east of old Easta Boga and continue 4 to 5 miles to the east. They were once covered with a fine growth of long leaf pine which has long since been converted into charcoal. They have lime sinks and occasional deposits of limonite. The ore of a deposit in the N. W. ¼ of N. W. ¼ of S. 12, T. 17, R. 6 E. has been dug some. See analysis of deposit 100 at the end of this chapter.

A pebbly limonite deposit occurs about ¼ mile west of Munford. Some ¾ mile south-west of this town or in S. E. ¼ of S. E. ¼ of S. 25, T. 17, R. 6 E., there are some limonite old diggings. The ore of these old diggings is of excellent quality, though it does not show up well as to quantity. It is more or less spongy and manganiferous. See analysis of deposit 99 at the end of this chapter.

Limonite, in a few large boulders of good spongy ore, shows between these diggings and Munford.

Limonite occurs in a very large deposit east of Jenifer or in the N. E. ¼ of S. 17, and N. W. ¼ of S. 16, T. 17, R. 7 E. It has been dug in many places, in open cuts from 10 to 30 feet deep, though not for some years. It is more or less different in the different diggings, though it is nearly all of pebbles or small nodules, the boulders being few. The surface showing is good. It is in a red loam. Some of the diggings have white *clay-horses*, which, in a general way, appear to run east and west. The ore is mixed in some of the diggings with boulders of ferruginous chert of a yellow ochreous color and in other diggings with some soft or webby chert with large pits. It is also mixed with some pyrolusite in some of the diggings. The ore is principally a compact liver colored ore, though some of it is black and waxy and some little of it is porous. It is high in iron and unusually so in phosphorus. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	80.401
Silica	12.443
Phosphoric Acid	1.720

Analyst, J. L. Beeson.

See also analysis of deposit 102 at the end of this chapter.

Cherty sandy ore, sandstones, and quartzites, in boulders, occur over the surface, along the south-east edge of these diggings. The sandstones and quartzites have milky white streaks and the weathering out of these streaks doubtless give rise to the angular gravels of milky quartz that occur over the surface. The State Geologist in his report for 1875, thus speaks of this limonite deposit: "The ore banks are in S's 16 and 17, and cover an area of about one mile square. The limonite is of the usual character. Towards the west the ore is purer, but in the eastern and southern portions of the field there is mixed with the good ore much that is cherty, and a good deal of the porous friable chert that we have met with so frequently.

"As to the thickness of the deposits, I can say but little. I saw myself no pits deeper than 15 feet, though I was told by one of the contractors, that the light yellow sand, below which they had found no ore, had been reached in several places, at depths varying from 15 to 20 feet.

"The limestone (for the Alabama Furnace, at Jenifer) at present is gotten from a layer of dolomite of this formation, in S. 18, near the furnace. The bed strike is north-east and south-west, and dip south-east. The greater part of the rock exposed at the quarry is a compact bluish limestone, or rather dolomite, as shown by the analyses given below. Some of the beds are of a gray color and a band or seam of hornstone traverses a part of it."

The following analyses of the above dolomites, are taken from the State Geologist's report for 1875:

	(1)	(2)
Carbonate of Lime	55.35	61.86
Carbonate of Magnesia	34.58	33.55
Siliceous Matter, insoluble	7.75	2.86
Iron and Alumina	1.48	1.09
Water and Loss	0.84	0.64
Total	100.00	100.00

These dolomites must carry some zinc and cadmium, as shown by the following analysis, from the above report, of furnace scale from the stack of the Alabama Furnace;

Silica	1.46
Iron and Alumina	3.62
Zinc and Cadmium Oxides, principally Zinc Oxide	91.70
Graphite, and Undetermined	3.22
Total	100.00

To the north-east of Ironaton to the county line, there are, at intervals along the edge of the broken country of (a) Talladega (Ocoee) Slates or along the great overthrust fault, outcrops of gray limestones, marbles in places, that are believed to belong to this formation. They dip under the (a) Talladega (Ocoee) Slates or the (a) Talladega (Ocoee) Slates have been thrust over on top of them. They make high bluffs in the S. E. ¼ of

S. E. ¼ of S. 12, T. 18, R. 6 E. and N. E. ¼ of S. W. ¼ of S. 29, T. 17, R. 7 E.

The *Brock Mountain* or *Lime Hill*, in the S. W. ¼ of S. 6, T. 17, R. 8 E., is a high point near the south-west end of the low ridge or line of hills between the *Choccolocco Valley proper* and the *Buck Horn Valley*. The top of this mountain or hill is a mass of loose chert over a cherty blue limestone that crops out on the steep north-west side of the mountain or hill as a high bluff that in places is overhanging. A high bluff of quite pure gray limestones occurs at the south-west end of this mountain or hill, about ½ mile to the south-west, at *Lime Hill Church*. These limestones were used for building culverts, etc., along the E. T. Va. & Ga. R. R. They are covered with a growth of red cedar and walnut.

Two large boiling springs and a knoll covered with limonite, occur in the low flat land of Choccolocco Valley to the north-west of Brock Mountain or Lime Hill, or in the S. E. ¼ of N. W. ¼ of S. 6, T. 17, R. 8 E.

Ponds and lime sinks are to be found in the Buck Horn Valley in the extreme north-east corner of the county.

(f) *Pelham (Trenton) Limestones*. This formation occurs in Talladega county only in its north-western and south-western corners. It is from 800 to 1200 feet thick, though it does not cover over 12 square miles of the surface area of the county.

In the north-western corner of the county, it is of 5, perhaps 6, narrow belts that are separated from each other by faults and still narrower belts of (i) *Oxmoor Shales and Sandstones* and (g) *Red Mountain (Clinton) strata*. Its belts have a general north-east and south-west trend. The most south-eastern and broadest three end suddenly on the south-west by butting up against a big overthrust fault or a broken country of the (e) Siliceous (Knox) Dolomite and Chert which has doubtless been thrust more or less over on top of them.

Its most south-eastern belt, something over ½ mile broad, shows outcrops of its limestones in T. 16, R. 5 E., in the north-east corner, and in the S. W. ¼ of N. W. ¼ of S. 1, and the N. W. ¼ of N. E. ¼ of S. 10. Its next or second belt, in the S. E. ¼ of S. 3, T. 16, R. 5 E., is also about ½ mile wide. Its limestones are usually from 3 to 10 feet below the surface, though occasionally they stick up above the surface. They show in a gully by the road side in the N. E. ¼ of S. E. ¼ of S. 3, T. 16, 5 E. They here have interstratified clayey streaks and are full of fossils and calcite streaks. The next or third belt shows an outcropping of its limestones around a big spring in the N. W. ¼ of S. W. ¼ of S. 3, T. 16, R. 5 E. The next or fourth belt crosses the county line in the N. E. ¼ of N. E. ¼ of S. 4, T. 16, R. 5 E. and forms a bluff from 75 to 80 feet high in the S. W. ¼ of S. E. ¼ of S. 8, T. 16, R. 5 E. The fifth belt sets in on the north-east just within the county or in the N. W. ¼ of N. W. ¼ of S. 4, T. 16, R. 5 E. and extends to the south-west to near the county line or the river at the Broken Arrow Shoals. Its limestones form high bluffs in T. 16, R. 5 E., in the S. E. ¼ of N. E. ¼ of S. 5 and N. W. ¼ of S. 6. A sixth belt most probably occurs, near the river, to the north-west of the fifth.

The rocks of this formation may cross over to the east side of the river or into this county near both the McGowan and Mardis ferries, as they occur on the west bank of the river at the mouth of Yellow Leaf Creek, a short distance above the former ferry, and at the mouth of Beeswax Creek, a short distance below the latter ferry. Some of the red lands on the east side of the river between these ferries may be underlaid by these limestones.

The outcrops of this formation in the south-west corner of the county help to form the outer edges of a synclinal basin. Beginning at a point near the county line south of the Talladega Sulphur Spring, they run about north, forming a flat narrow valley some 300 yards broad along the eastern edge of the basin. The Talladega Sulphur Spring is in this valley. These rocks begin to broaden as they bend around the north-east end of the basin about ½ mile north of Cedar Creek. From here they extend as a belt about ½ mile broad down the western edge of the basin or down Cedar Creek to its mouth and then down the river to beyond the county. They are over a mile broad at the north end of the basin. On the east side of the basin, they are engulfed in a fault for a short distance just outside of the county. With this exception, they are continuous all around the edge of the basin, which is some 9 miles long and 3 miles broad at its widest part along Peckerwood Creek.

Their outcrops at the Talladega Sulphur Spring have calcite streaks and thin impure interstratified seams of dull ashy color. They are mostly quite pure, though some of them look siliceous. They are a fetid bituminous limestone on a branch in the northern part of the S. E. ¼ of S. E. ¼ of S. 28, T. 21, R. 2 E. They are here just under a black bituminous shale that is believed to be Sub carboniferous. In this shale, there is some hollow concretionary limonite, altered pyrite.

The limestones of this formation make fine outcrops in T. 21, R. 2 E., in the S. E. ¼ and N. W. ¼ of S. W. ¼ of S. 28; the S. E. ¼ and N. W. ¼ of S. E. ¼ of S. 29,; and in T. 22, R. 2 E., in the N. E. ¼ and S. E. ¼ of N. E. ¼; and in many other places. Some of these outcrops form glady places, some of them are full of characteristic fossils, and some of them have over their weathered surfaces pit marks, like those of rain drops in soft mud, while others have furrows and ridges. They make fine farming lands along Cedar Creek and the river. They in places at least, are believed to be separated by a small fault from the broken country of (i) Oxmoor Shales and Sandstones of the central part of the basin, the (f) Fort Payne Chert being wanting or almost so in many places.

To the north-west of the above synclinal basin, there is a ridge of (e) Siliceous (Knox) Dolomite and Chert, the top of an anticlinal and then another broken and faulted synclinal basin with a belt of flat valley lands of this formation around the most of it. The narrow belt or valley of this formation on the south-east side of it crosses the river just above the mouth of Cedar Creek and extends between one and two miles to the north-east before it becomes entirely engulfed in a fault.

The strata of this formation on the north-west side of the faulted synclinal occur on the west bank of the river at the mouth of Beeswax Creek, and they may cross the river and underlie some of the red lands to the south-east and east of Mardis' Ferry.

The rocks of this formation may also cross the river just above McGowans Ferry, as they occur on the west bank of the river at the mouth of Yellow Leaf Creek.

(4) *Upper Silurian,* (g) *Red Mountain (Clinton)* Formation.—The only rocks of this formation in Talladega county are in the north-west corner of the county. They are only a few feet in thickness and cover less than 1 square mile of the surface area of the county. They consist of sandstones with perhaps some shales. They also carry some little hematite, at least in one place. They are, so far as has been seen, of only three lines of outcrops, that are just to the south-east of respectively the second, third, and fifth belts of the (f) Pelham (Trenton) Limestones. They may occur just to the south-east of also the fourth belt of (f) Pelham (Trenton) Limestones, though they have not been seen there. In the three lines of outcrops seen, they are not continuous like accompanying strata but are merely in places. If they were ever deposited in the intervening gaps, they were completly wased away from over them before the deposition of the immediately overlying Sub-carboniferous strata.

The sandstones, sometimes calcareous, are mostly flaggy and of a dark ashy gray color. They are sometimes massive, as the ledge 4 to 5 feet thick on top of the ridge in the S. E. ¼ of S. W ¼ of S. 5, T. 16, R.5 E. Some loose pieces of siliceous red ore (hematite) were picked up in the loose chert just over this massive sandstone. The loose chert must therefore cover some of the rocks of this formation, though, as it is believed, only a few feet of them. The siliceous ore is nothing more than ferruginous masses of coarse rounded flint grains.

(5) *Lower Sub-carboniferous*, (h) *Fort Payne Chert*. This formation does not cover over 3 square miles of the surface area of Talladega county. It is very irregular in its occurrence, especially in the south-west corner of the county. Its strata, like those of the underlying (g) Red Mountain (Clinton) strata, do not appear to have been deposited in places or, if they were deposited in certain places, they were washed away from over these places before the deposition of the next overlying strata. Its maximum thickness in the county is not over 50 feet. Its characteristic cherty strata becomes more and more replaced towards the south-east by black bituminous shales with interbedded thin sandstones that can't be distinguished from those of the overlying (h) Oxmoor Shales and Sandstones. These shales and sandstones come in at the top and bottom of the formation.

This formation, in the north-west corner of the county, is of three parallel belts that correspond to the ridges just to the south-east of respectively the third, fourth, and fifth belts of (f) Pelham (Trenton) Limestones. This repetition of narrow parallel belts of the same strata is due to parallel faults along the tops of unsymmetrical anticlinals whose steep dipping north-west halves are engulfed in the faults and whose gently dipping south-east halves have been washed down into the present valleys and ridges of Silurian and Sub carboniferous strata. The most south-east of the above ridges is, in this county, nothing more than a line of knolls. The other three ridges are also more or less broken up into knolls near their south-west ends or as they butt up against a big overthrust fault or broken country of (e) Siliceous (Knox) Dolomite and Chert. Parts of them are most probably covered up by the overthrust (e) Siliceous (Knox) Dolomite and Chert. The most south-east of these ridges ends towards the south-west in the S. W. ¼ of S. E. ¼ of S. 5, T. 16, R. 5 E., while the other two continue on for about a mile farther to the south-west. The most north-west one begins on the north-east just within the county on the north or in the S.W.¼ of N. W ¼ of S. 4, T. 16, R.5 E., while the other two come from away beyond the county. There is a fourth ridge capped with this formation that starts in on the north-east near the center of the S. W. ¼ of S. 5, T. 16, R.5 E., and extends to the south-west to near the river. It is joined at its north-east end by a high gap with the next ridge to the south-east.

The sloping south-east sides of the above ridges are covered with loose nodules of fossiliferous chert, with, in places, some few nodules of limonite. This loose chert varies very much in thickness, not only on the different ridges but also on the same ridge, and this is also doubtless true of the underlying bedded cherty strata. These cherty strata in the south-west corner of the county are almost entirely replaced by the shales and sandstones. It is very strange that these cherty strata, as shown by loose nodules over the surface, should be continuous, though thin, on the east side of the narrow Talladega Sulphur Springs Valley, not over 300 yards broad, and be wanting, with the exception perhaps of an occasional nodule, on its west side, the synclinal basin side, It may be that they are engulfed in a fault on this west side, though it is rather believed that they were never deposited there. The same may be said of the north-east end of the synclinal basin where the fossil chert just without the basin is much more abundant. This fossil chert just to the east of the Talladega Sulphur Spring, and perhaps in other places to the north, is just to the west of a thrust fault along which it has doubtless in places been partly covered up by the Cambrian strata just east of the fault being thrust over on top of it. North of the Sulphur Spring, (i) Oxmoor Shales and Sandstones gradually come in between this chert and the fault. A black carbonaceous shales with interstratified thin sandstones crop out from under this chert in places.

There are, however, a few patches of very scattering cherty nodules within the synclinal basin to the west of the Talladega Sulphur Spring. These patches must be along faults. There are however none of these cherty nodules along the western edge of the basin, where they ought to be, though, strange to say, they do occur just over a narrow anticlinal to the north-west, where they form a line of outcrops that is probably continuous from where it crosses the river, the county line, a short distance above the mouth of Cedar Creek, to its north-east end in the N. E. ¼ of N. E. ¼ of S. 32, T. 21, R. 2 E. Its loose cherty nodules are much more numerous in places than in others. The black carbonaceous shale with interstratified thin sandstones crop out in places from under it.

(6) *Upper Sub-carboniferous*, (*i*) *Oxmoor Shales and Sandstones*. This formation, as a very broken piney woods country, makes nearly all of the 20 square miles of surface area of the Sub-carboniferous strata in Talladega county. Its strata are from 1000 to 1500 feet thick. Its sandstones, usually covered with shining quartz crystals, have sometimes a slight calcareous look. Its shales, black and carbonaceous when first dug up, are of dark gray, brown, etc., colors on the weathered surfaces.

This formation, in the north-west corner of the county, occurs in parallel belts between ridges of (h) Fort Payne Chert and valleys of (f) Pelham (Trenton) Limestones. Between it and the latter, there are of course faults. It, in many places, extend some distance up the sloping south-east sides of the [h] Fort Payne Chert ridges and knolls. It also occurs as a broken piney woods country to the north-west of its series of parallel belts or between them and the river, the county line.

The most south-east belt has in the shales along its south-east edge some little bluish chert. These shales, of a dark color, have in them also some white streaks of calcareous matter. The shales, with their thin inter-bedded sandstones, of the fourth belt are naked over a considerable area in the S. W. ¼ of N. W. ¼ of S. ¼, T. 16, R. 5 E. The shales along the Wood's Ferry road have some streaks of black smutty or coaly shale and some concretionary balls of limonite from pyrite. They in many places along the river, as in the Embry Bend, are covered with rounded flint pebbles.

In the south-west corner of the county, this formation is of two areas; one outside of and around the synclinal basin just west of the Talladega Sulphur Spring and the other within this basin. These two areas are separated by lower rocks of the tops of faulted anticlinals. The former one starts in about east of the Sulphur Spring and gradually broadens to the north until, at the north end of the basin or as it goes around the north end of the basin, it is nearly a mile broad. Still farther west and south-west, it merges into a second faulted synclinal basin with its north-east end, over two miles wide, in this county. Its broader portions make a very broken country: the interstratified sandstones, being more massive than usual and having a steep dip, making high sharp ridges. As it merges into the second or north-west synclinal basin, its strata are badly broken up. This second or north-west synclinal basin has in its lower strata two massive ledges of sandstones from 9 to 10 feet apart. The lower ledge is from 8 to 10 feet thick and the upper one is from 4 to 5 feet thick. These massive sandstones doubtles correspond to the *Hartselle Sandstone* of North Alabama. They, down next to the river, on the north-west side of the synclinal trough, have a dip of about 20 deg. to the south-east, and on the south-east side of the trough are about vertical. On the north-west side of the trough, however, they are flattened over towards the north-west as if they once extended over an anticlinal to the north-west. On the south-east side of the basin, they form shoals in crossing the river. They are covered with shining quartz crystals. The shales, with thin bedded sandstones, under, between, and over these massive sandstones, are arenaceous and fissile and often, at least, of a deep black color. Their thin bedded or flaggy sandstones are often also carbonaceous or black. These flagstones, on being struck with the hammer, fly into many rhomboidal pieces.

The former synclinal basin, the one just westofthe Sulphur Spring, is also a very broken country. It appears to be cut up by north east and south-west faults. On its eastern edge, near its northern end, there is a rocky row of broken up sandstones, with an almost north and south strike and a dip of 60 deg. to 80 deg to the west. The strata all along this eastern edge are nearly vertical and badly crumpled and broken up, and so it may be that there is a fault between them and the (f) Pelham (Trenton) Limestones to the east of them in which the (h) Fort Payne Chert is engulfed. The ridges of this basin stop south of Cedar Creek, though some of its strata may cross to the north of the creek. One of the north-east and south-west faults that pass through this basin can be seen in the S. E. ¼ of S. E. ¼ of S. 5, T. 22, R. 2 E. Along this fault, there are a few scattering nodules of fossil chert and a ledge of sandstone that runs about N. 15 deg. E. and dips 80 deg. to 85 deg. to the east. This ledge farther south is about vertical.

THE GOLD MINING, AND THE MARBLE INDUSTRY OF TALLADEGA COUNTY.

By W. Taylor.

To a limited extent, the mining of gold as well as the quarrying and working of marble, began at quite an early period in the history of the county.

GOLD MINING.

The discovery and mining of gold at Dahlanega and other points in north-east Georgia, almost contemporaneous with the early settlement of the north-eastern counties of Alabama, by the whites, very naturally stimulated search for the metal in some of these counties, where all the analogous geological formations and topographical characteristics were found. As the counties were then constituted, Randolph, Tallapoosa, Coosa, and the eastern part of Talladega, were believed to embrace in their territories the auriferous deposits. Mining prospectors were soon in the field. The search was not without success. Placer gold was found, and for years profitably mined in the early thirties, and early forties, at Arbacoochee, Randolph county (now Cleburne), and at Goldville, Tallapoosa county, and to less extent and profit at other points.

It is not known to the writer, to whom credit is due as the first discoverer of gold in Talladega county, but the first attempt perhaps, at mining gold in the county with machinery, was made by Messrs. Randall, Hudson & Yarbrough, at an early day in the history of the county, on Hatchett Creek, S. 34, T. 20, R. 6 E., now in the county of Clay. Placer gold was found in the dirt and gravel. It was extracted by washing in *long-toms*, rockers and other methods used in placer mining, and collected by amalgamation. These gentlemen worked this mine, known as the "Hatchett Creek or Howell Mine," at intervals for a few years, when, the business becoming unremunerative, it was finally abandoned by them. Other parties subsequently took up the work at various times, but never with satisfactory results. No work worthy of note has been done at this mine in the past thirty years.

A few miles north-east of the "Harrell Mine," in the neighborhood of Idaho, Clay county, formally in Talladega, considerable mining has been done on the Hobbs' property, S. 3, T. 19, R. 7 E., and in W. D. Haralson's Mines, in S. 33, T. 19, R. 7 E.

The Hobbs property was leased for a term of years by Mr. A. Shanker of St. Louis, a gentleman of means and mining skill, who expended on it a considerable sum in labor and machinery with promise of profitable results, but the property became involved in litigation and consequently the indefinite supension of all mining operations.

Mr. Haralson's "Chincopino Mine" was equipped with a five stamp mill which he operated for a time with more or less profit, but, with insufficient capital for mining with modern and improved processes, he withdrew from the business. Mr. Haralson has great confidence in the value of these mines when worked on a liberal scale and by improved methods. The ore occurs in decayed gneiss and the vein is five or six feet wide, containing or yeilding three or four penny-weight of gold per ton. It is free milling and with proper equipment can be extracted at a profit where there is not less than a penny-weight of gold to the ton of rock. Mr. Haralson owns two or three mines in the neighborhood of his "Chincopino Mine" which prospect well but on which no regular mining has been done. Mr. G. T. Hobbs holds a property near the Hobbs Mine, for a time worked by Mr. Shanker, which he says shows a fine prospect but no mining has been done on it.

All the mines heretofore mentioned lie east of Blue Mountain that runs from north-east to south-west and is the highest range in Alabama. These mines are located on or near a much lower ridge that divides the waters of the Coosa and Tallapoosa rivers. The ores are usually found in a kind of crystalline schist. They mine freely, and are relatively free from the presence of sulphurets, when compared with the ores that are found a few miles to the west.

West of Blue Mountain, a very different character of gold ore is found. It occurs at intervals, for many miles, on a line nearly parallel with and from one to one and a half mile east of the line of the talcoid slates or base of the metamorphic hills traversing the eastern part of Talladega county from north-east to south-west. These ores are found in quartz seams imbedded in the shales, or in quartz veins across the shales. Ores occurring along this line, when found near the surface or long exposed to the action of the elements, mill freely and are easy of reduction, but when taken from below the point of weathering they are associated with sulphurets and are highly refractory in character.

For nearly sixty years, these ores have been mined in primitive way at various times and places. The ioneer in mining of this class of ore is believed to be licajah Lyles, who discovered and mined gold in a small vay in S. 9, T. 20, R, 5 E. a short time after the organization of the county. Since Mr. Lyles' day no efort has been made at mining on this property.

In the early forties, James Robb discovered gold on S. 19, T. 12, R. 6 E. For some years, when not engaged n the cultivation of his crop, with no facilities for minng more than a pick, pan, and a mortar and pestle, he would often secure a penny-weight of gold or more a lay.

After the death of Mr. Robb, George G. Hunt, an old Georgia miner, worked at this mine irregularly for several years. With only the most primitive implements and methods and the assistance of one hand, the writer has known him to save as much as thirty penny-weights of gold a week. Of course, with the use of such crude and limited methods, this was not a constant saving, out he never failed to make fairly renumerative wages until he followed the vein so deep that it could no longr be worked profitaby with hand labor alone. In evilence of the amount of gold extracted by Mr. Hunt by is crude methods, Mr. J. F. Warmick gives the assurnce that the books of his father, Thos. Warmick, for many years engaged in the jewelry business in Tallaega, show an aggregate of six thousand penny-weights urchased from this old miner, who also at times sold is earnings to other parties.

The gold in this mine is found in a quartz seam nbedded in the slate, dipping to the south-east at an gle of about forty degrees and below drainage associated with sulphurets. This property is known as the "Robb or Thomason Mine."

With systematic mining, the use of proper machinery and improved methods of reducing refractory ores, it is believed this mine could be very profitably worked.

A part of this property belongs to the estate of the late F. M. Thomason, Esq., of St. Clair county, and a part to the Ala. Mineral Land Co., without the control of which the mine can not be turned to profitable account.

The gold mining property known as the "Storey Mine," on Talladega Creek, S. 17, T. 19, R. 6, was discovered in the early fifties, by George Hunt, heretofore mentioned. Soon thereafter it was conveyed to A. G. Storey, Andrew Cunningham, and others, who organized a mining company and with liberal outlay of labor and money built a dam on the creek, secured a good power, planted a ten stamp mill, with other gold saving machinery, and began mining under favorable auspices, which for some years they continued, with profit at times and sometimes at a loss. The company, none of whom were practical miners, finally discouraged with the refractory character of the ores from the presence of sulphurets, leased the property in time to various parties who worked it with varying success, some making little in the venture while to others it yielded large profits. On the authority of one of the men working in the mine at the time, the writer is informed that one of the lessees, Mr. Hale, secured from a given point in the vein, in a space comprising scarcely more than a cubic yard, nearly three thousand penny-weights of gold.

The mine has never been worked in a systematic way. The pits and tunnels have been excavated in hap-hazard le, without proper regard to drainage or economy in removal of material. With systematic mining and proved methods of treating refractory ores, this mine ght to pay handsome dividends. It is believed an gregate approximating 100,000 dollars has been taken om this mine.

The "*Waldo Mine*," the property of the Riddle Bros., as discovered but a few years since, in S. 16, .19,R.6. Before making any considerable effort to work e mine themselves, the Merss. Riddle sold an option on e property to J. M. Sullivan and others, who prompty organized, *The May Virginia Gold Mining Company*, ho expended some thousands of dollars in mining achinery. The machinery was modern and much of it rst class. A steam engine and a Wiswell mill,a battery nd Ingersoll drill, were among the outfit. They excavated everal hundred tons of gold bearing quartz, in much f which free gold was visible to the naked eye. Altoether,it was an attractive looking mass of ore and promsed fine results. It was reduced to powder under a low of water by the Wiswell mill and collected in a ide wooden trough. The heavier concentrates were ow collected but the show of gold was sadly disappointng. Indeed, less gold was visible in the concentrates han in the uncrushed quartz. The amalgum was only small amount of what was expected. The managenent were disheartened at the result.

The probable explanation of this failure is that the free old being reduced to fine powder by the crushed quartz nd wheel was carried off and lost by the adhesive slaty r talcoid matter which saturated the water flowing rom the wheel. Some of these decomposed shales seem o have the property of thoroughly emulsifying water, ften covering the surface with bubbles after the manner of soap, conditions obviously highly unfavorable to the saving of gold in fine particles.

From whatever cause the gold was lost from their mass of ore thus manipulated, the expectations disappointed, and the funds of the company being exhausted, the property was turned back to the proprietors and the corporation went out of existence.

This property is believed to be valuable and is now worked on a limited scale by the Messrs. Riddle and others. The ore is hauled from the mine, more than a mile, to Waldo where it is milled at a satisfactory profit. The gold obtained is of the purest character. Recent shipments to the mint at New Orleans netted nineteen dollars per ounce. On much of the California gold, less than sixteen dollars per ounce is realized.

THE MARBLE INDUSTRY.

The presence of marble in Talladega county was known soon after its earliest settlement, but the great extent and variety of the stone was not fully realized until more recent years. The marbles occur at the north-western base of the metamorphic hills, bordering the eastern edge of Talladega valley, as they traverse the county from north-east to south-west. Their outcroppings are found, at intervals, for more than forty miles. In quantity, these marbles are practically inexhaustible; while in quality and fineness of texture, many of them are scarcely surpassed by the finest Italian marble.

As worthy of passing remark, it may be proper to note, that, on or near the line on which these outcroppings of marble occur, is a fault. A striking peculiarity of this fault, is a topograhical feature of which the writer has seen no mention. A well defined valley or depression marks it. This valley at some points is scarcely three hundred feet in width and at other places nearly or quite a mile wide. It is almost without grade, though the hills on either side often rise to altitudes of one to two hundred feet. All of the larger streams traversing the county, flowing from the east, as Choccolocco, Geahah, Talladega, and Tallasseehatchee, cross this narrow valley nearly at right-angle and yet the water divides between these streams, are passed almost without notice,as one follows the valley, so inconsiderable are the elevations. The Ala. Mineral R. R. is for many miles located in this irregular valley and where confined to it the grading is of the lightest character.

The marble industry, like gold mining, had its beginning at a very early period in the history of the county. The Messrs. Herd (George, David, Alexander, and Thomas), four enterprising Scotch brothers, were the first to raise and dress marble from the quarries of Talladega county. They opened their first quarry, in the latter thirties, near Sylacauga. For many years, they carried on a profitable business in their line, chiefly in the manufacture of tombstones urns, statues, and other decorative work for the cemetery. At a subsequent period, this firm opened and operated a second quarry near the present station Rendalia, on the Ala. Mineral R. R. Finally they went out of the marble business, selling out to Messrs. H. B. Oden & Co.

Mr. J. M. N. B. Nix was at one time prominent in the marble business of Talladega. Mr. Nix had for some years previously operated a marble yard at Wetumpka, buying and shipping the bulk of his stone from the Vermont quarries. In the fervor of sharp business competition with the Messrs. Herd Bros. and others working Talladega marble, he openly endeavored to depreciate these marbles by boldly advertising, "No Talladega marbles worked in this yard." Becoming convinced, however, of the value of Talladega marbles, he purchased a quarry on Emawhee Creek, where for several years he carried on quite an extensive business.

The firm of Taylor, Gantt, & McKenzie, composed of John R. Taylor, Edward Gantt, and Henry McKenzie, was formed in 1846. Dr. Gantt owned a valuable quarry near Sylacauga, while Mr. Taylor and Dr. McKenzie each owned extensive quarries, closely adjacent, about a mile east of Taylor's Mills on Talladega Creek. They began work without delay, built a mill for sawing the stone, at Taylor's Mills, operated by water power, where the marble was hauled in blocks and sawed into such shapes as was desired. Their finished work was hauled in wagons and set up in the cemeteries of Tuskegee, Marion, Tuskaloosa, Huntsville, Florence, and other parts of the State. This firm was finally dissolved, and the business was continued under the name of John K. Taylor & Son, but was discontinued on the death of the son, Jno. K. Taylor, Jr., in 1855.

The firm of H. B. Oden & Co., having for members of the firm, Henry B. Oden, Andrew W. Bowie, James G. L. Huey and perhaps others, became the successors of the Messrs. Herd Bros., by the purchase of their upper quarry. They began business about the year 1858 and until the beginning of the war of secession, in 1861, did quite an extensive business. This property, after passing through several ownerships, is now in the possession of the Clifton Iron Company, who, when their furnaces are in blast, use large quantities of the stone for fluxing.

Since the close of the war, the marble interest of Talladega county has been comparatively dormant. A. W. Bowie, Esq., who owned the Oden Quarry, near Randalia, leased the property to a Mr. Magarin of Memphis, Tenn. This gentleman began operations and raised a considerable quantity of marble with the view of shipping it in bulk to Memphis but abandoned the undertaking without much practical results. Subsequently an effort was made to do something in this line, in 1878, by Messrs. John Leak & Sons, of St. Louis, who bought the Taylor quarries, moved to the property and began work in a limited way, but, with insufficient capital for proper development, they ceased to make any further effort at quarrying.

The Messrs. Leak finally sold this property to Geo. W. Chambers of Talladega, who now owns it. In one of these quarries, there is a seam of blue marble of great superiority. Although scarcely beneath the surface, a section of rock is shown, comparatively free from defects, from which blocks may be quarried perhaps thirty inches thick, as wide as desired, and sixteen to twenty feet long. This quarry presents quite a variety of stone in the way of colors, with great fineness of texture.

Near to this quarry is the marble property belonging to Mrs. M. L. Taylor of Talladega, with a handsome variety of marbles. By the way of testing, in some degree, the capacity of this quarry, Mrs. Taylor had an exploration to be made with a diamond drill to a depth of two hundred and nineteen feet, all the way in the marble and without passing through it. The actual thickness, therefore, remains unknown.

An interesting episode marks the marble history of Talladega. When the Washington National Monument was projected, the management solicited from all the States of the Union, so disposed to contribute, a block of their best native stone, to which would be given a prominent place in the monument. The order of the A. F. & A. Masons of Alabama, patriotic and alive alike to private benevolence and public munificence, at once manifested a laudable interest in the matter. The Grand Lodge of the State reflecting this interest in a practical manner at its annual meeting, Dec. 6th, 1849, promptly resolved to furnish the block of marble with a sufficient appropriation of money to cover all expenses attending the preparation and shipping of the stone. The resolution prescribed that the stone should be, "A block of Alabama Marble, four feet long, two feet high, with a depth of bed of twelve inches, upon which a designated inscription should be made." The block was accordingly raised from the Gantt quarry, hauled to a marble shop in Talladega, where it was handsomely finished. The inscription read :

"Alabama Marble."
"Presented by the M. W. Grand Lodge of Free and Accepted Masons of the State of Alabama to the Washington Monument Society."

"The seal of the Grand Lodge was elegantly and elaborately wrought, and the lettering done in good style by a competent workman."

Thus completed, the block was carefully packed and shipped to the Monument Society, in the autumn of 1851. Under date of Nov. 6th, 1851, Elisha Whittelsay, general agent of the Washington National Monument, wrote Saml. H. Dixon and John M. Moore, committee of the Grand Lodge of Alabama: "I have great pleasure in informing you that the beautiful block intended to represent the Grand Lodge of Alabama in the National Monument has reached 'Monument Place' in good condition." * * * * * * "It will be assigned a becoming position in the great edifice it will so worthily adorn." * * * * *

For the dates and facts relating to the history of this famed block of Talladega marble, the writer is indebted to Hon. H. Clay Armstrong, secretary of the Grand Lodge of Alabama, who kindly furnished him with a complete transcript, from the records of his office, bearing on the subject. The facts serve to dispel the fiction, to some extent prevalent in the public mind, that the management of the monument for a time refused to place the block in the structure, on the ground that it was held to be surreptitious, or, in other words, that it was Italian marble and not a native stone of Alabama. On the contrary, the block promptly found its destined place, and, to visitors of the Washington Monument, it bears an abiding testimony to the beauty, purity, and high qualities of Alabama marble.

In conclusion, it may be stated that no statistics of the marble industry of Talladega county are available, hence the incompleteness of the sketch here presented. The amount of capital employed in the business at one time was considerable, and the profit fairly good, but the exact amount of either cannot be approximately named after the lapse of so many years. The reader is not to infer that the marbles of the county have ever been thoroughly explored. Many of the outcroppings have not been touched, while those on which work has been done have not been seen below the weathering point. They have, therefore, furnished only a small per centage of really perfect stone, for it is a well known fact that the bulk of the rock above drainage is so marred by dries and seams and other defects as to be unfit for building or ornamental purposes. The best quarries of the world, it must be remembered, yield but a small proportion of perfect stone. The renowned Carrara quarries, from whence is obtained the celebrated Italian statuary, yields annually only about 500 tons of this class of stone out of the product of the labor of 3,000 men, the great bulk of the production being common marble. When enterprise and capital shall have properly developed the Talladega marbles, it is believed they will be found unsurpassed in extent, variety, and texture, by the products of the most famed quarries of the world.

ABSTRACTS OF REPORTS BY MAJ. G. D. FITZHUGH AND MR. H. B. C. NITZE ON THE REGION ALONG THE ANNISTON AND ATLANTIC RAILROAD IN TALLADEGA COUNTY.

Maj. Fitzhugh's Report.

Localities and Names Mentioned of Limonite Deposits.

Deposits.	Section.	Township.	Range	Name.
(1*)	W. 1-2 of SW 1-4 of S. 5	22 S.	2 E.	T. F. Russell's.
(2*)	SE. 1-4 of S. 15 and W. 1-2 of S. 14.	22 S.	2 E.	Moses Hamilton's.
(3*)	W. 1-2 of NW. 1-4 of S. 2, and SE. 1-4 of NE. 1-4 & N.E. 1-4 of SE. 1-4 of S.3	22 S.	2 E.	Hardee & Russell.
(4)	E. ¼ of S. 10	22 S.	2 E	Sulphur Mountain.
(5)	S 1.	24 N.	16 E.	John Edwards'.
(6*)	NE. 1-4 of S, 35.	21 S.	2 E.	Wm. McPherson's.
(7)	Corner of S's 26, 27, 34 & 35.	21 S.	2 E.	
(8)	NE 1-4 of S 22.	21 S.	2 E.	K. J. Thomas'.
(9)	SE. 1-4 of S. 27.	"	"	B. C. Haslett's.
(10)	NE 1-4 of S, 34.	"	"	W. R. Phillips'.
(11)	NW 1-4 of SW. 1-4 of S. 28	"	"	J. D. Boaz's.
(12)	SW 1-4 of S. 21.	"	"	Ala. Min. Land Co.
(13)	NW 1-4 of S. 32.	"	"	Robert Russell's.
(14)	SW 1-4 of S. 36.	21 S.	2 E.	J. M. Mims'.
(15)	NE. 1-4 of S. 1.	22 S.	2 E.	
(16*)	NE. 1-4 of S. 36.	21 S.	2 E.	Wm. Brewer's.
(17*)	SW. 1-4 of S. 32.	21 S.	2 E.	Mary Adair's.
(18)	NE. 1-4 of S. 32.	"	"	C. Zuber's.
(19)	NW 1-4 of S. 4.	21 S.	3 E.	
(20)	SE. 1-4 of S. 32.	"	"	
(21)	W 1-2 of S. 27	"	"	
(23*)	SW. 1-4 of S. 21 & SE. 1-4 of S. 20.	21 S.	4 E.	Levi Sherrill's
(24*)	NE 1-4 of S. 17.	"	"	James Sherrill's.
(25*)	SW 1-4 of S. 17.	"	"	Woodstock I. Co.
(26)	SE. 1-4 of S. 21.	21 S.	3 E.	
(27)	Center of S. 27.	"	"	John Burke's.
(28*)	SW. 1-4 of S. 7 and NW 1-4 of S. 18.	21 S.	4 E.	Brown Ore-beds.
(29)	S. 1-2 of S. 5.	22 S.	3 E.	Martin & Gooch.
(30*)	W. 1-2 of S. 12.	22 S.	2 E.	Riggins & Averett.

[31]	S's 5, 4 & 3.	22 S	3 E.	
[32]	S. 25.	21 S.	3 E.	
[33]	S. 30.	21 S.	4 E.	
[34*]	SW. 1-4 of S. 1.	22 S.	3 E.	Jessie Nevins.
[35*]	S. 9.	23 N.	16 E.	
[36*]	SE. 1.4 of S. 10 and N. E. 1-4 of S. 15.	18 S.	5 E.	Ed Miller and Poor House.
[37*]	Northern parts of S's 10 & 11 and southern part of S. 3.	18 S.	5 E.	
[38*]	S. 4.	"	"	Ogletree & Grady.
[39*]	S's 33 & 34.	17 S.	5 E.	Ogletree & Story.
[40*]	S. 33.	"	"	Adams & Green.
[41*]	S. 15.	17 S	5 E.	
[42*]	S's 30, 31 & 32.	"	"	T. I. & S. Co.
[43*]	NE. 1-4 of S. 29.	"	"	T. I. & S. Co.
[44*]	S's 13 & 14.	18 S	4 E.	Chambers & T. I. Co.
[45*]	NE. 1-4 of S. 12.	"	"	T. F. Elliott.
[46*]	W. 1-2 of S. 12.	"	"	J. T. Ragan's.
[47*]	SW. 1-4 of S. 13.	"	"	"
[48*]	SE. 1-4 of S. 12.	"	"	A. W. Huston's.
[49*]	NW. 1-4 of S. 21.	"	"	Phillips' Mill.
[50*]	NW. 1-4 of S. 28.	"	"	Hephzibah Church.
[51*]	NW. 1-4 of S. 12.	19 S.	3 E.	Cook Beds.
[52*]	SE. 1-4 of S. 1	"	"	Lanier beds.
[53]	S. 8.	19 S.	4 E.	Stone Place.
[54*]	NE. 1-4 of S. 26.	19 S.	3 E.	Baker Mines.
[55*]	E. 1-2 of SW 1-4 of S. 24	"	"	W. E Cook Mines.
[56*]	SE. 1-4 of S. 6.	18 S.	6 E.	Jarrett Gross'.
[57]	S. 14.	18 S.	5 E.	
[58]	SE. 1-4 of S. 17.	"	"	
[59*]	NE. 1-4 of S. 20.	"	"	Shocco Springs.
[60*]	S. 16.	19 S.	4 E.	
[61]	S's 25 & 26.	18 S.	5 E.	
[62]	S's 34 & 35.	"	"	
[63*]	S's 2, 3, 10, & 11.	19 S.	5 E.	Weisinger, Hendrick and Bishop Mines.
[64*]	S's 15, 16, & 21.	"	"	Lewis. Terry. Chambers.
[65*]	S's 5, 7, & 8.	20 S.	5 E.	Flournoy & Welch.
[66]	S's 5, 7, & 18,	19 S.	5 E.	J. M. Lewis'.
[67]	S. 28.	19 S.	4 E.	Mrs. Duncan's.
[68*]	S's 12 & 23.	"	"	W. T. Webb's.
[69]	Near center of S. 8.	19 S.	5 E.	H. M. Burt's.
[70*]	S's 19, 20, 29, & 30.	"	"	Carlton beds.
[71*]	S. 31.	"	"	Whiting & Reynolds
[72*]	S. 36.	19 S.	4 E.	" " "
[73*]	S. 6.	20 S.	5 E.	" " "
[74*]	S. 1.	20 S.	4 E.	" " "
[75]	S's 3, 4, 9, & 10.	"	"	Heacock ore beds.
[76*]	Near center of S. 8.	"	"	Riser Mines.
[77]	S's 14 & 15.	"	"	Ledbetter ore beds.
[78*]	SW. 1-4 of S. 15.	"	"	" " "
[79]	NE. 1-4 of S. 21.	"	"	Glaziner & Barnet.

[80*]	S's 28 & 29.	20 S.	4 E.	A. G. Pendley's.
[81]	SE. 1-4 of S. 19.	“	“	Singleton ore bed.
[82]	SE. 1-4 of S. 27.	“	“	N. K. Huston's.
[83*]	S. 11.	21 S.	4 E.	“Plear Place.”
[84]	S. 8.	20 S.	6 E.	
[85*]	S. 30.	18 S.	6 E.	Jim Curry Banks.
[86]	S's 27. 21, 20, 17, 16, & 15	“	“	
[87]	S's 4 & 5.	19 S.	6 E.	Stockdale Mines.
[88]	NE. 1-4 of S. 12.	19 S.	5 E.	Dr. Wm. Taylor's.
(89)	N. W. ¼ of S. 7	19 S.	6 E.	Dr. Wm. Taylor's.
(90)	N. E. ¼ of S. 14	“	“	
(91)	N. W. ¼ of S. 15	“	“	
(92*)	Two miles west of Irouaton			Tom Jones' Farm.
(93*)	One mile south of Ironaton			Clifton I. Co. Mine.
(94*)	Near Ironaton			“ “ “ “
(95*)	One-half mile north of Ironaton			
(96*)	One and one-half miles north of Ironaton			Dye Mines.
(97)	S. 14	18 S.	6 E.	
(98*)	North-west of McEldery one and one-half miles, or in S. 36	17 S.	6 E.	Parker Mines.
(99*)	Near Dr. Spence's, Munford			Camp ore-beds.
(100*)	S. E. ¼ of S. 14	17 S	6 E.	John Bruce's
(101)	One mile west of Munford			
(102*)	Half-mile south-east of Jeniifer			
(103*)	S's 5 & 6	17 S.	7 E.	

*See analysis in following table.

Analyses.

Deposit	Silica	Met Iron	Manganese	Alumina.	Lime	Sulphur	Phosphorus	Water.	Analyst.
1	4.000	52.706	0.400	10.366	0.790	0.027	0.279	8.422	A. F. Brainerd.
2&3	8.440	50.630	0.300	9.676	0.624	0.013	0.055	8.475	" " "
6	13.000	45.258	0.240	7.517	0.469	0.015	0.754	12.353	" " "
16	6.950	49.654	0.400	10.177	0.702	0.082	0.251	11.349*	" " "
17	6.650	51.037	0.950	10.108	0.612	0.013	0.167	8.345*	" " "
23	14.000	48.026	0.359	4.258	0.468	0.041	1.378	9.071*	" " "
24	7.800	45.094	1.189	13.950	0.546	0.033	0.251	‡	" " "
25	8.600	50.468	0.232	7.891	0.624	0.044	0.225	9.811*	" " "
28	8.820	53.862	0.946	0.962	0.7[illegible]0	0.008	0.678	9.305*	" " "
30	15.500	53.555	0.400	0.500	0.646	0.013	0.117	6.25[illegible]*	" " "
34	22.300	47.952	0.920	1.693	0.624	0.013	0.530	4.712‡	" " "
35	23.750	39.070	......	8.029	1.560	0.020	0.642	8.389‡	" " "
36	15.900	49.766	0.600	2.587	0.273	0.019	0.318	8.769‡	" " "
37 38 & 39.	7.980	56.320	0.400	2.860	0.468	0.005	0.125	7.549‡	" " "
40	11.610	50.176	0.500	5.397	0.646	0.005	0.120	9.881†	" " "
41	9.070	49.254	1.684	1.748	0.234	0.054	0.1[illegible]8	16.[illegible]9‡	" " "
42	5.752	51.840	0.630	5.752	0.444	0.005	0.081	7.[illegible]3‡	" " "
43	7.35	52.41	Trace	4.08	0.22	Trace	0.16	1.10†	W. B. Phillips.
45 46. 47 & 48.	5.250	59.217	0.350	Trace	1.014	0.007	0.183	8.358†	A. F. Brainerd.
49 & 50	6.640	57.798	0.740	Trace	0.521	0.013	0.083	9.310	" " "
51 & 52.	10.000	54.296	0.550	2.790	0.312	0.013	0.112	8.494*	" " "
54 & 55.	25.000	45.000	0.530	2.433	0.468	0.005	0.058	6.13[illegible]*	" " "
56	13.50	48.88	Trace	4.44	0.30	Trace	0.16	0.90†	W. B. Phillips.
59	5.15[illegible]	55.807	1.210	2.846	0.078	0.028	0.088	10.491*	A. F. Brainerd.
60	15.180	45.604	0.550	9.633	0.457	0.023	0.279	8.335‡	" " "
63	12.630	52.015	1.100	4.116	0.390	0.013	0.097	7.095	" " "
64	22.820	46.899	0.580	0.834	0.388	0.004	0.217	7.872‡	" " "
65	23.00	44.72	Trace	3.66	0.20	Trac	0.56	0.45†	W. B. Phillips.
68	24.50	43.84	Trace	4.48	0.20	Trace	0.20	0.95†	" " "
70	4.30	52.31		......	......	......	0.04	......	......
70	7.500	53.598	1.100	7.000	0.468	0.019	0.125	8.46‡	A. F. Brainerd.
71 72, 73 & 74.	4.730	56.934	0.400	2.080	0.312	0.001	0.104	10.90‡	" " "
76	20.440	47.260	0.000	0.633	0.522	0.014	0.377	9.99‡	" " "
78	14.60	49.89	Trace	5.62	0.30	Trace	0.11	0.30†	W. B. Phillips.
80	8.80	56.95	Trace	2.52	Trace	Trace	0.39	0.95†	" " "
81	6.50	53.29	Trace	6.96	0.30	Trace	0.56	0.75†	" " "
83	8.00	45.51	0.28	3.26	0.30	Trace	0.56	1.00†	" " "
85	31.30	38.05	Trace	4.64	Trace	Trace	0.33	0.80†	" " "
92	13.10	48.88	0.21	5.26	0.60	Trace	0.33	1.10†	" " "
93	15.50	43.08	1.28	7.98	0.60	Trace	0.11	1.60†	" " "
94	13.30	48.88	0.36	5.24	0.60	Trace	0.22	1.15†	" " "
95	5.40	55.94	Trace	2.70	0.80	Trace	0.50	1.00†	" " "
96	13.32	47.37	0.56	5.52	0.80	Trace	0.31	1.20†	" " "
98	24.40	46.36	Trace	0.88	0.50	Trace	0.11	0.40†	" " "
99	8.25	47.62	1.28	3.92	0.80	Trace	0.28	1.05†	" " "
100	16.60	47.88	Trace	5.72	1.00	Trace	0.19	1.30†	" " "
102	5.60	55.44	Trace	3.02	0.40	Trace	1.20	0.65†	" " "
103	13.50	47.88	0.42	6.46	0.60	Trace	0.14	0.85†	" " "

* Combined Water. † Water at 212 deg. F. ‡ Undertermined [Combined water, etc.]

Many of the above deposits have surface indications of being very extensive, while others make but very poor surface showings, though they are seemingly very extensive below the surface, commencing from 4 to 8 feet below the surface. Many of them have been worked very extensively in open cuts and deep pits, while others have only been *scratched*, and others still have not been touched. They are mostly in a residual mass of sandy and reddish loams. The ore in some of them is much more, strictly speaking, pocket ore, than in others. The deposits, as a whole, appear to be about equally of wash or gravelly and lump ore. The gravelly ore frequently predominates at the top. The ore is estimated to make about ⅛ in weight of the mass. The lump ore is picked out by hand and the gravelly ore, when gotten, is commonly merely screened through about a 5–8 inch wire mesh. This gravelly or wash ore, however, at some few of the larger mines is put through a log washer and then carried to the furnaces and roasted in open heaps. These ores, as a general thing, are of very good quality, as can be seen from the above analyses, though some of them are quite high in phosphorus and some are very siliceous or are *rough* or *rocky* ores.

Mr. Nitze's Report.

Mr. H. B. C. Nitze, E. M., in his report on the mineral deposits along the Anniston and Atlantic Railroad between Talladega and Sylacauga, mentions many of the above limonite deposits and some others. He gives analyses of the following deposits:

Localities and Names of Additional Analyzed Limonite Deposits.

No.	Section.	Township.	Range.	Name.
(1)	S. ½ of S. ½ of S. 31	19 S	5 E.	Reynolds & Whiting.
	and N. ½ of N. ½ of S. 6	20 S	5 E.	" "
(2)	S. 7	20 S	5 E.	Riser, Welsh & Flournoy
(3)	S's 23 and 14	19 S	4 E.	W. T. Webb.
(4)	S. W. 1-4 of S. E. 1-4 and S. E. 1-4 of S. W. 1-4 of S. 8	20 S	4 E.	Riser & Mallory Beds.
(5)	S. W. 1-4 and W. ½ of S. E. 1-4 and S. ½ of N. W. 1-4 of S. 4, and E. ½ of S. E. 1-4 of S 5.	20 S	4 E.	Heacock & Thompson.
(6)	N. E. 1-4 of S. W. 1-4 of S 5	20 S	4 E.	Woodstock Iron Co.
(7)	N. E. 1-4 of N. E 1-4 of S. 9	20 S	4 E.	Dr. Heacock's.

Analyses.

Deposit.	Silica.	Met. Iron.	Phosphorus.	
1	4.318	58.810	0.035	W. C. Stubbs, Analyst.
1	4 85	56.87	0.42	Furnished by Mr. Walter Crafts.
1	6.00	52.64	0.565	" " "
2	8.40	50.40	0.688	" " "
2	6.40	52.64	0.222	" " "
2	8.56	58.31	0.48	W. C. Stubbs, Analyst.
3	7.49	55.15	0.06	Analyst, Peen. Railroad Co., Altoona, Pa.
4	8.69	59.37	0.46	Furnished by Mr. Walter Crafts.
4	9.93	55.30	0.47	Analyst, W. C. Stubbs.
5	8.87	54.32	0.23	Furnished by Mr. O.M. Reynolds
6	7 50	50.51	0.078	Furnished by Mr. Walter Crafts.
7†	7.30	51.52	0.512	" " "
7*	7.60	52.19	0.42	" " "

† On ridge. * In field.

Mr. Nitze speaks of Bog Iron Ore in the bed of Little Tallaseehatchee Creek in S. 28, T. 20, R. 4. E. and in the road in the S. W. ¼ of S. W. ¼ of S. 22 and N. E. ¼ of S. 28, T. 19, R. 5 E. He describes it as a soft cellular mass with the cells filled with clay and sand.

Magnetic or Gray Iron Ore.

Maj. Fitzhugh's Report.

Localities and Owners of Outcrops.

Outcrops.	Section.	Township.	Range.	Owners.
*(1)	S. W. 1-4 S. 15...	22 S.	2 E.	Moses Hamilton's
(2)	N. E. 1-4 of S. 35............	21 S.	2 E.	Wm. McPherson's
(3)	S. 18 (At Oden's Mill).....	21 S.	4 E.	
*(4)	N. E. 1-4 of S. 17............	21 S.	4 E.	James Sherrill's
*(5)	S. E. 1-4 of S. 34..........	20 S.	4 E.	
*(6)	Half-mile south of Sycamore			.J M. Lewis'
*(7)	S. 9 (opposiie Dr Heacock's)	20 S.	4 E.	Dr. Heacock's

* See analysis in following table.

Analyses.

Outcrops.	Silica.	Met. Iron.	Manganese.	Alumina.	Lime.	Sulphur.	Phosphorus.	Titanium.	Water.	Analyst.
(1)	40 103	36.272	0.800	13.373	0.700	0.037	0.330	....	2.078[1]	A F Brainerd
(4)	38.10	35.17	Trace	6.06	0.60	trace	0.36	0.00	0.40[2]	W B Phillips
(5)	7.05	61.23	"	5.10	0.20	"	0.16	0.00	0.10[2]	" "
(6)	7.10	59.47	"	4.22	0.80	"	0.16	0.00	0.05[2]	" "
(7)	17.35	51.91	0.20	4.78	0.80	"	0.30	0.00	0.10[2]	" "

[1] Undetermined (Water, etc.). [2] Water at 212 deg. F.

Outcrop (1) is of a stratified seam about 3 feet thick; outcrop (2) is merely loose fragments; outcrops (3) and (4) are of a stratified seam that is respectively 2 feet and 4 feet thick, though the latter or thicker outcrop is badly split up by shale and clay partings; outcrop (5) is of two stratified seams of about 7 feet each in thickness, separated by about 25 feet of shales and sandstones; outcrop (6) is seemingly float that shows down to the bottoms of test pits 10 feet deep; and outcrop (7) is of three stratified seams that are respectively of 5, 6 and 7 feet in thickness, about 25 feet apart.

Extracts from Mr. Nitze's Report on the Magnetic or Gray Iron Ore between Talladega and Sylacauga.

"The seam crops out on the western slope of the ridge opposite Mr. Riser's house, starting in S. 9, from whence it can be traced through S's 16, 17, and 20, T. 20 S., R. 4 E.

"In the N. E. ¼ of N. E. ¼ of S. 17, Mr. Riser has put down a test-pit on the seam, exposing it very clearly. Its true thickness here is 6.76 feet.

An analysis of it, furnished by Mr. Walter Crafts, shows:

Silica	21.98
Metallic Iron	46.83
Phosphorus	3.00
Sulphur	0.00

"On the ridge opposite Dr. Heacock's house in S. 9, three seams crop out, all of which have been exposed in test pits. They are near the summit of the ridge and rather siliceous in appearance.

"Top seam at summit of ridge, dip 66 deg. S. E., thickness 7 feet.

"Middle Seam, 25 feet above bottom seam, dip 48 deg. S. E., thickness 6 feet, bottom hard shale.

"Bottom Seam, dip 50 deg. S. E., thickness 5 to 6 feet.

"From the top seam, 100 tons have been taken out and shipped to the Woodstock Iron Company, Anniston.

"Analysis 7 (Maj. Fitzhugh's Report) is of an average sample from the pits on these three seams.

"Five analyses of this ore, furnished by Mr. Walter Crafts of the Woodstock Iron Company, shows:

	(1)	(2)	(3)	(4)	(5)
Silica	12.84	19.30	11.70	4.40	20.80
Metallic Iron....	56.01	49.28	54.47	61.37	47.28
Phosphorus.......	0.11	0.62	0.195	0.666	0.563
Lime	0.50				

"In the S. E. ¼ of S. E. ¼ of S. 16, T. 20, R. 4 E., on Mr. Burke's place, the same ore is exposed by two large pits, cut into the side of the ridge, showing up two distinct seams.

"These seams are evidently the top and middle seams on the Heacock place. The bottom seam should be found near the summit of the ridge or over the western slope, but as yet it has not been uncovered.

"Top Seam, dip 68 deg. S. of E., thickness 7 feet.

"Middle Seam, dip 48 deg. S. of E., thickness 6 feet.

"This ridge ends in S. 16, just back of Mr. Burke's house...... it rises again about ½ mile to the south on Mr. Barnett's land...... There is a spur from this ridge in the western half of S. 21 on which the ore shows up on Ragan's, Shackelford's, and Smoot's lands, respectively, but very silicious.

"Three analyses of Burke's Magnetic Ore, furnished by Mr. Walter Crafts, shows:

	Surface.	Top Vein.	Bottom Vein.
Silica	12.750	11.00	33.40
Metallic Iron	60.920	59.03	42.89
Phosphorus	0.025	0.091	0.15

"On Mr. Lewis' land in N. E. ¼ of S. 34, the *lead* can again be distinctly traced ..... The top of the ridge is covered with the outcrop. A shallow test pit here exposed a seam of ore about 7 feet thick...... The ore is of very fine quality, the best that I saw. An analysis, furnished by Mr. Walter Crafts, shows:

Silica	13.80
Metallic Iron	58.01
Phosphorus	0.096

"The outcrop crosses the section line at about its middle point, running into S. 35, T. 20, R. 4 E. In a test pit here, the width of the seam is about 7 feet, dip 25 deg. S. of E...... The top of this ridge is noticeably covered with outcroppings. The deposit extends about 1 mile farther south...... In S's 11 & 16, T. 21, R. 4 E., very silicious outcrops were noticed.

Limestones and Marbles.

Maj. Fitzhugh's Report.

Localities and Owners of Analyzed Outcrops.

Outcrops.	Section.	Township.	Range.	Owners.
[1]	S. ½ of S. W. 1-4 of S. 28...	21 S.	3 E.	John Burk's
[2]	N. E. 1-4 of S. 22	21 S	4 E.	E. J. Hickman's
[3]	N. E. 1-4 of S. 18 ...	20 S.	5 E.	Bowie or Weewoka Marble Quarry.
[4]	W. ½ of S. W. 1-4 and S. W. 1-4 of N. W. 1-4 of S. 29,	20 S.	4 E.	
[5]	N. W. 1-4 of N. E. 1-4 of S. 16	21 S.	4 E.	Heard's
[6]	One mile east of Barclay Station, on T. & C. V. R'd			
[7]	S. E. 1-4 of S. 35	18 S.	5 E.	G. W. Chambers
[8]	N. W. 1-4 of S. 35........	21 S.	3 E.	Dr. Geo. Hill's Marble
[9]	E. ½ of S. E. 1-4 of S. 2	22 S.	3 E.	Gannt Marble Quarry
[10]	N. W. 1-4 of S. 36	20 S.	4 E.	Nix Marble Quarry
[11]	S. E. 1-4 of S. 12..........	19 S.	5 E.	Dr. Taylor's Marble

Analyses.

Outcrops.	Lime Carbonate.	Magnesia Carbonate.	Iron Oxide & Alumina	Silica.	Phosphorus.	Sulphur.	Analyst.
[1]	53.00	42.50	0.50	3.05	0.00	Trace	W. B. Phillips.
[2]	92.960	3.320	*0.116	2.800	0.014	0.026	A. F. Brainerd.
[3]	78.720	18.984	*0.700	1.300	0.027	0.102	" "
[4]	54.60	36.75	1.00	6.50	0.00	Trace	W. B. Phillips.
[5]	90.80	Trace	0.40	2.70	Trace	Trace	" "
[6]	49.510	47.341	*0.800	2.330	0.013	0.000	A. F. Brainerd.
[7]	56.820	40.219	*0.760	1.600	0.013	0.005	" "
[8]	55.00	42.06	0.80	3.00	Trace	Trace	W. B. Phillips.
[9]	99.193	0.140	*0.280	0.280	0.027	0.026	A. F. Brainerd.
[10]	97.60	Trace	0.30	1.35	Trace	Trace	W. B. Phillips.
[11]	95.600	0.662	*0.480	2.800	0.027	0.005	A. F. Brainerd.

* Iron Oxide.

CHAPTER XIII.

CALHOUN COUNTY.

The geological formations of this county are as follows:

(8) *Carboniferous*	(k) *Coal Measures*	1000–1500 feet
(7) *Upper Sub-carboniferous*	(j) *Oxmoor Shales and Sandstones* [*Hays' Floyd*]	800–1500 feet
(6) *Lower Sub-carboniferous*	(i) *Fort Payne Chert*	25–150 feet
(5) *Devonian*	(h) *Black Shale*	0–50 feet
(4) *Upper Silurian*	(g) *Red Mountain* (*Clinton*) *Formation*	0–600 feet
(3) *Lower Silurian*	(f) *Pelham Limestones* (*Trenton and Chazy*)	1000-1800 feet
	(e) *Siliceous* [*Knox*] *Dolomite and Chert* (*including the Red Lands or Easta Boga Limestones or Upper Connesauga*)	3000–4000 feet
(2) *Cambrian*	[d] *Coosa* [*Flatwood*] *Shales* (*Contemporaneous with Connesauga*)	300-500 feet
	[c] *Montevallo* [*Variegated*] *Shales* (*Hays' Rome and Lower Connesauga*) *Aldrich* [*Beaver*] *Limestones*	1500-2500 feet
	[b] *Weisner* [*Chilhowee*] *Sandstones*	2500+feet
(1) *Crystalline*,	[a] *Talladega* [*Ocoee*] *Slates and Conglomerates, Semi-crystalline.*	

[1] *Crystalline*, [a] *Talladega* (*Ocoee*) *Slates and Conglomerates, Semi-crystalline.* These semi-crystalline strata make something over 20 square miles of the surface area of Calhoun county. They are confined to and make the broken mountainous country to the south-east of the Choccolocco Valley. Their territory is boundded on the south-east by the county line and on the north-west by a great overthurst fault [Talladega Fault]. Along this fault they often appear to overlie, perfectly conformably, Cambrian and Silurian strata. When the underlying or adjacent strata are of badly changed or metamorphosed shales, as they sometimes are, it is a somewhat difficult matter to mark out exactly the fault

or boundary line of the formation. Some of its strata without a doubt are metamorphosed Cambrian strata. Its strata are badly contorted and broken up. They however, as a general thing, have a steep south-east dip, though in places they are bent over towards the north-west until they are comparatively flat. They may carry some auriferous seams, as they do to the south-west in Talladega county, though no such seams are known of to the writer in this county.

A massive schistose sandstone, a conglomerate in places, that crops out on Cathey's Creek just before it empties into Shoal Creek or in the N. E. ¼ of N. W. ¼ of S. 13, T. 15, R. 9 E., has been used some for building purposes. It carries some small flattened talc pieces. Higher up Shoal Creek or in the S. W. ¼ of N. E. ¼ of S. 13, T. 15, R. 9 E., there are shoals of a bluish gray micaceous schistose sandstone that make a fine water power. Near here, there is a reported thick quartz seam that is rich in copper pyrites.

Milky quartz, as loose nodules, occurs over the hydro-mica shales to the south-west. These shales have also near their north-west edge some pockets of spongy limonite or gossan. They also have in places some black waxy limonite that is high in both iron and phosphorus. The hydro-mica shales have often a copperas color on their massive bedded outcrops, while their loose thin shales are of pearly white color. The interstratified sandstones have sometimes a greenish tinge from the presence of glauconitic grains. These sandstones in other places have been changed into quartzitic schists.

(2) *Cambrian*. This formation, visible to a thickness of from near 4500 to about 5500 feet, covers nearly 200 square miles of the surface area of Calhoun county. It makes

a broad broken mountainous belt that extends clear through the county from north-east to south-west. This belt lies principally just to the south-east of the East Tennessee Virginia and Georgia Railroad. It, in a general way, is of a broad elevated anticlinal with a great overthrust fault winding along its north-west edge and with numerous other smaller faults running up into and through it. To the north-west of it and the railroad, there are detached patches of Cambrian strata, as the belt or ridge that sets in about north-west of Alexandria and extends to the north-east to about north-west of Jacksonville, and a smaller patch that occurs still farther to the north-west or on the head waters of Ball Play Creek. This smaller patch is connected with the great body of flatwoods to the north, along the Coosa River. The Cambrian strata of Calhoun county are of the (d); *Coosa* (*Flatwood*) *Shales* (*Contemporaneous with Hayes' Connesauga,*) (c) *Montevallo* (*Variegated*) *Shales* (*Same and Lower Connesauga*), *and Aldrich* (*Beaver*) *Limestones, and* (b) *Weisner* (*Chilhowee*) *Sandstones.*

(b) *Weisner* (*Chilhowee*) *Sandstones.*—This formation, with a maximum visible outcrop of over 2500 feet, makes the Choccolocco or Jacksonville Mountains, the Terrapin or Ladiga Mountains, the Coldwater Mountain, and several hills or short ridges on the south-east side of the Choccolocco Valley to the west and north-west of Old Davisville. It is therefore, with the exception of the Collwater Mountain, confined to the south-east of the E. T., Va., & Ga. R. R. It covers [illegible] 50 square miles of the surface area of the county. The mountains are bounded on the north-west by great overthrust faults. As it is made up of hard quartzites and conglomerates with interstratified softer strata or shales; and as its strata are badly folded, faulted, and broken up, it forms high rugged mountains with lofty peaks. Some of these peaks are over 2000 feet above sea level, and over 1300 feet above the level of the adjacent valleys. Its mountains, though they are but parts of the same broad elevated unsymmetrical anticlinal, are separated from each others by faults and narrow belts of overlying strata. They are not single mountains with lofty peaks but, on account of the folding, crumpling, and faulting of the strata, are much more complex in their structure, each consisting of an aggregation of mountains. The strata are in waves within waves and wrinkles within wrinkles. Each mountain has long slender finger-like spurs extending out from it, with usually more nearly north-east and south-west trends than the main mountains. These are of smaller unsymmetrical anticlinals and usually have faults along their steep north-west sides. Some of these smaller faults extend clear through the mountains, in gaps and low places, though they usually gradually die out as the crests of the main mountains are approached. The high and low places of the mountains, however, are commonly due to great waves in the strata with north-west and south-east trends. The main mountains, as well as their spurs, have usually along their crests ledges or back-bones of the hard massive quartzites and conglomerates. These massive rocks frequently crop out as high bluffs and broad rocky rows that extend continuously for miles. Between their lodges, in the softer shales, there are in places depressions that hold water, and in this way there are ponds on the tops of the mountains over 1000 feet above the adjacent valleys. There are also sinks on these mountains, that are partly due to faults.

These mountains and their spurs have their steep north-west sides for the most part covered with the loose quartzites and conglomerates. They have in their top strata many large deposits of limonite that is usually black and waxy and high in both iron and phosphorus. These limonite deposits are most common along near the faults. The ore, however, has come for the most part from stratified seams at or near the top of this formation, though the deposits are now most common in the red loam covering the bottom strata of the overlying Aldrich (Beaver) Limestones.

Coldwater Mountain is the intersection of two great faulted unsymmetrical anticlinals with respectively a northeast-southwest trend and a northwest-southeast trend. Its structure however is badly complicated by smaller unsymmetrical anticlinals, faults, etc. Its strata show in many places the faults, waves within waves, wrinkles within wrinkles, etc. It is the broken up south-west end of the Jacksonville or Choccolocco Mountains from which it is separated by the badly faulted irregular narrow unsymmetrical synclinal valley of overlying strata detween Oxford and Anniston. The faults cross this valley diagonally or in a general north-east and south-west direction.

The Coldwater Mountain strata can be seen to go under this valley and under overlying strata at the south-west and north-east ends of the mountain but on the north-west side of the mountain they are stopped by an overthrust fault.

At the south-west end of this mountain or about in the N. W. ¼ of N. E. ¼ of S. 32, T. 16, R. 7 E., there are many fine springs gushing out from under a knoll of massive conglomerates. These springs give rise to Coldwater Creek, a swift flowing stream from 40 to 50 eet broad and 1 to 2 feet deep. The water is somewhat hard and is as clear as a crystal. It is pumped into a reservoir on the side of the mountain from whence it is taken to supply the city of Anniston.

On the southern face of this mountain, in its upper strata, about in the S. W. ¼ of S. 27, T. 16, R. 7 E., there are two immense sinks. They are separated from each other by merely a sharp rocky ridge. Their rims, mainly at least, of the bedded quartzites are unbroken. One of these sinks is funnel-shaped and the other is pear-shaped. The former or south-west one is very regular in its outlines. It is near ¼ mile broad and near 200 feet deep. A stream of water is said to rise and disappear within it. The other or north-east one is even larger, though it is not so uniform in its outlines. It looks somewhat like a deep ravine with a sharp ridge across its lower part. These sinks appear to have been formed by the intersection of two sharp unsymmetrical synclinals, with perhaps the help of faults. They are believed to have once held some of the overlying Aldrich (Beaver) Limestones that give rise to the red loams just to the south of the southern rims.

On the top of Coldwater Mountain, there are some bald places or spots of considerable area of perfectly naked rocks that are almost flat. These prominent points are doubtless the tops of two intersecting waves.

This mountain has the rocky rows along its top and also along the tops of its spurs. Its eastern spurs, between Oxford and Anniston, show plainly the waves, faults, wrinkles, etc., in its strata. These spurs are of wrinkled unsymmetrical anticlinals with a general north-east and south-west trend and with faults along their north-west edges. They show both the waves and wrinkles, with a north-west and south-east trend as well as those with a north-east and south-west trend. The depressions between these spurs or the synclinal troughs carry for a short distance back into the mountain the red loam from the disintegration of the overlying Aldrich Limestones. A fault extends clear through the mountain from the south-west end of Glen Addie, and it may be that others of the faults are likewise continuous through the mountain.

Along the fault at the east foot of the north-east end of the mountain, the quartzites of the mountain are in contact with (c) Montevallo (Variegated) Shales. These quartzites, with a stratified covering of breccia of angular pieces of quartzite held together by a light colored siliceous matrix, can be seen dipping towards the north-east under the overlying strata at the extreme north-east end of the mountain, near the Cotton Factory. They are here in an anticlinal, of unsymmetrical waves, with a north-east and south-west trend. These waves are about 100 feet long from bottom of trough to bottom of trough. They are steeper on their south-east than on their north-west sides, something unusual.

Around this north-east end of the mountain, on both sides of it and just to the north-east of it, there are numerous large deposits of limonite. Many of these deposits have been worked very extensively, one of them perhaps more extensively than any other limonite deposit in the State. The accompanying Plate XXXII is a photographic view of one of the banks of this extensive deposit during the *boom*.

These deposits are along faults and in a red loam that has doubtless come from the disintegration of the overlying Aldrich Limestones. They usually have along with their ore more or less of the breccia, in loose pieces, of the mountain rocks.

There is also said to be some bauxite along with the limonite on the north-west side of the mountain near the overthrust fault. The limonite and bauxite both doubtless came from the top strata of this formation but as they are now in a red loam that is believed to cover and to be partly from the disintegration of the overlying Aldrich Limestones, they will be considered along with those limestones.

The *Jacksonville or Choccolocco Mountains* are continuous from Oxford to Piedmont. They are separated from the Coldwater Mountain at their south-west end by the narrow faulted valley between Oxford and Anniston and from the Terrapin or Ladiga Mountains at their north-east end by the narrow broken faulted valley along the road between Piedmont and White Plains or along Nancy and Cottaquilla creeks.

The *Blue Mountain* to the north-east of Anniston is but a part of these mountains, as their strata are connected.

These mountains at and near their southtwest end are of a single broad unsymmetrical anticlinal with a fault just to the north-west of them, as can be seen in the Snow Creek Gap through which the Georgia Pacific Railroad passes. To the north–east, however, they become complicated by folds and faults into an aggregation of mountains.

The Blue Mountain, in a general way, has a similar structure to the Coldwater Mountain or it is the intersection of two great faulted unsymmetrical anticlinals with respectively northeast-southwest and northwest-southeast trends. It is also bounded on the north-west by a great overthrust fault and is also badly complicated by smaller folds and faults.

Along some of these faults, as along the big overthrust fault to the south-west of Anniston, there are some large limonite deposits. These deposits have been dug into in many places in the low broken hills along this fault just to the north-west of the mountains in the southern part of S. 8, T. 16, R. 8 E. These old diggings now however show but little ore. The ore has doubtless for the most part been covered up by debris. From one of these diggings in the south-west corner of S. E. ¼ of S. 8, T. 16, R. 8 E, a great deal of boulder ore is said to have been taken. The ore is compact and mostly liver colored, though some of it is black and manganiferous. A good average sample of it, dried at 100 deg. C., gave the following partial analysis:

Ferric Oxide	72.468
Silica	11.995
Phosphoric Acid	0.671

Analyst:—J. L. Beeson.

In and around these old diggings, there are boulders of a yellowish ochreous sandstone or breccia, with often a flinty look. This breccia shows in a great many places along the faults.

A spur, the Cemetery Ridge, leaves the mountains in the south-east edge of Anniston and extends to the south-west to the Georgia Pacific Railroad or until it almost connects with Coldwater Mountain. It is just to the south-east of an overthrust fault along which there are numerous limonite banks that are now within the corporate limits of Anniston.

The broad anticlinal of the mountains can be seen along the Anniston and DeArmanville wagon road to be faulted and to be in unsymmetrical waves and wrinkles with both northeast-southwest and northwest-southeast trends. On this road on top of the mountain, though to the south-east of the crest of the mountain, there is an outcropping of stratified limonite, and still farther to the south-east, on the south-east slope and along the south-east foot of the mountains, there are other deposits of limonite, more or less stratified, in a deep red loam along with a great deal of float or loose rocks from the mountain.

The sandstones of these mountains in the "Rocky Hollow" to the north-east of Anniston have been quarried extensively for building purposes. They are well suited for this purpose, as they harden on exposure and when first quarried are soft enough to be easily cut and sawed into any required shapes. They are of beautiful white and pinkish colors and make handsome buildings. Some of them have running through them in all directions dendritic depositions of manganese dioxide. The above quarries show the strata to be in the two sets of waves, one with a northeast-southwest trend and the other with a northwest-southeast trend.

Several limonite banks also occur in and near the "Rocky Hollow." One of these banks, near the head of a short ravine that comes into the hollow from the south-east or about in the S. W. ¼ of S. W. ¼ of S. 33, T. 15, R. 3 E., has a good exposure of ore. Some of this ore is botryoidal, though it is mostly rocky or siliceous. Another of these banks, in the S W. ¼ of S. 33, T. 15, R. 8 E., is said to have furnished a great deal of manganese ore for the manufacture of *spiegeleisen* in the Woodstock Furnace No. 1, Anniston. Its manganese ore however seems to have been about exhausted. Concerning this ore and its spiegeleisen, there is the following account in Part III Mineral Resources of the United States, 1894:

"So far as has been ascertained, no manganese ore proper has ever been produced in a commercial way in

Alabama, though at times the brown hematite iron ores of this State carry a considereable percentage of manganese, thin streaks of rich crystalline manganese ore being occasionelly found. As early as 1875, these manganiferous iron ores were utilized in the blast furnaces of the Woodstock Iron Company at Anniston, Calhoun county, in the manufacture of spiegeleisen, the ores carrying at that time about 20% of manganese. Recent analyses do not give so large a percentage, 12 per cent being a better average. The manganiferous ores occurred in connection with the iron ores of the neighborhood, sometimes as veins and crusts from 1 to 3 feet in thickness, resting on the iron ore, in other cases in chimneys or pockets in the main ore belt or vein. The use of these ores at the Woodstock furnaces was the first attempt in the United States to manufacture spiegeleisen and ferromanganese from manganese ores, the only spiegeleisen made in the country prior to this having been made by the New Jersey Zinc Company from the residuum from zinc ores. The total amount of spiegeleisen made by the Woodstock Company was about 1,000 tons, containing, usually, from 8 to 20 per cent of manganese, though some ferro with as much as 60 per cent of manganese, was produced. Some recent analyses of these ores are as follows:

Analyses of manganese iron ores from Woodstock, Ala.

	(1)	(2)
Metallic Iron	38.50%	41.76%
Metallic Manganese	11.44	13.68
Phosphorus	0.27	0.55
Combined Water	11.62	10.06

The above bank, though about exhausted of manganese ore, still shows considerable limonite. Some of this limonite is of unusual good quality, while some of it is argillaceous. It is a compact dark brown and liver colored ore. An average sample of it, dried at 100 deg. C., gave the following partial analysis:

Ferric Oxide	70.565
Silica	7.614
Phosphoric Acid	0.853

Analyst:—J. L. Beeson.

Several limonite old diggings are to be seen on one of the ridges of Blue Mountain in the S. W. ¼ of N. W. ¼ of S. 34, T. 15, R. 8 E. Their ore is in boulders and gravels in a red loam. It is for the most part a compact liver colored ore, though some little of it is black and waxy and some little of it is porous. An average sample of it, dried at 100 deg. C., gave the following partial analysis:

Ferric Oxide	78.262
Silica	10.434
Phosphoric Acid	2.802

Analyst, J. L. Beeson

The above analysis shows this ore to be very high in phosphorus.

Along the north-west and south-west foot of Blue Mountain, there are some deep sand and clay pits. The clay, of very good quality for the manufacture of fire bricks, etc., is in very irregular pockets in the more or less stratified white and pinkish sands with rounded or water worn flint and quartzite pebbles.

A shallow pond occurs on top of the mountains about in the S. E. ¼ of N. W. ¼ of S. 1, T. 16, R. 8 E, It is in some softer or shaly strata just to the south-east of and over a massive ledge of sandstone.

The hard black wazy limonite, mostly rocky or siliceous, in a stratified ledge 12 to 14 feet thick, occurs high up on the south-east side of the mountains near the center of S. 1, T. 16, R. 8 E. It is just to the south-east of or just on top of a ledge of white quartzite near the top of this formation. Its rocky or siliceous portions on weathering become friable and thus the sand separates from the iron, leaving loose nodules and small boulders of very good ore.

Limonite, in considerable quantity, occurs over the surface along the foot of the mountains in the N. W. ¼ of S. 12, T. 16, R. 8 E.

The *Bob Garrett Limonite Banks*, two in number, are high up on the side of the mountains in the N. E. ¼ of S. W. ¼ of S. 6, T. 16, R. 9 E. The upper bank, some 200 yards higher up on the mountains than the other, has a large showing of ore, though much of its ore is rocky or siliceous. Much of it is also of very light weight or is very porous. This porous ore is principally in nodules and smaller boulders, and appears to have been derived from the breaking up on weathering of the larger and more rocky boulders. The larger boulders carry white specks, spots, and splotches of either soft or loose white sand or hard quartzite. The porosity of the ore is due to the weathering out of these white specks, spots, and splotches. Some of this ore has a slick black waxy look. It is at the top of this formation and just to the south-east of or just over a massive ledge of quartzite.

The ore of the lower bank is partly good and partly rough or rocky with the white specks and splotches of siliceous matter. This bank has in it considerable poor shaly ore or ferruginous argillaceous shale that is called *slate* by the miners.

A good average sample of the better or spongy ore of these two banks, dried at 100 deg. C., gave the following partial analysis:

Ferric Oxide	72.920
Silica	21.470
Phosphoric Acid	1.296

Analyst, J. L. Beeson.

The above analysis shows the phosphorus to be quite high.

Other limonite banks occur lower down the mountains and along the foot of the mountains. One of these, in the north-west corner of N. E. ¼ of N. W. ¼ of S. 7, T. 16, R. 8 E., is of a spongy ore that is mixed with loose sandstones and ferruginous sandy gravels. Its ore shows up much better on being dug into than it does over the surface. A good average sample of it, dried at 100 C., gave the following partial analysis:

Ferric Oxide	72.243
Silica	16.897
Phosphoric Acid	0.7.4

Analyst, J. L. Beeson.

Still lower down the mountain, near the foot of the foot hills in the S. E. ¼ of N. W. ¼ of S. 7, T. 16, R. 8 E., there is an old test pit in a pocket of *pot-ore* that is botryoidal on the inner surfaces.

On the north-west side of the mountains to the north-east of the Blue Mountain, there are some deep irregular coves between high projecting spurs. The strata in their strike bend around the edges of the coves and ends of the spurs, thus showing that the line of the great overthrust fault is very crooked. Its *hade* must therefore be very great. The breccia along the fault is in many places a poor limonite and occasionally a very good limonite. It is sometimes a poor manganese ore, with the boulders partly covered by a thin hard shell of pyrolusite. It is usually porous like cinder with quartz crystals lining the cavities. These shining crystals occur also over the surfaces of the rocks. The limonite in the N. E. ¼ of S. 26 and N. W. ¼ of S. 24, T. 15, R. 8 E., is of very good quality or is a black waxy ore, high in iron and phosphorus.

Limonite and pyrolusite were seen at intervals following two stratified seams on the south-east side of the mountains to the north-east of the Shrader Gap or in the eastern part of S. 17, T 15, R. 9 E. These exposures are just on top of massive ledges of quartzite and conglomerate at the top of the formation. Some of them are of limonite and others of pyrolusite. Their ores are mostly rough or rocky with white specks and splotches of siliceous matter, though they have specimens that are high in iron or manganese. These picked specimens are usually black and waxy and also high in phosphorus. These ores often occur as thin seams through the massive quartzite boulders and as thin shells over the surface of the boulders.

The *Landrum Limonite Bank* is on the north-west side of the mountains, at the foot of a pear shape pine hill in the S. W. ¼ of S. W. ¼ of S. 6, T. 15, R. 9 E. Its ore is in large boulders with some few pebbles. It is in considerable quantity, though much of it is rough or rocky. It is also mixed with loose rounded flint pebbles and with nodules of sandstone and conglomerate. It is very irregular in its occurrence, both as to quantity and quality. In some of the pockets it appears to be nearly all good ore while in others it is so sandy as to break with a smooth fracture like a sandstone along a plane of stratification. It shows in several large outcrops at the big or south-west end of the hill and but little in the north-east end of the hill. A boulder of this ore, of near the size of a barrel, was seen protruding from a large oak tree, the tree having grown around it. The ore is compact and mostly of a dark brown color, though some of it is of a liver color. It is of very good quality, as a whole, as shown by the following partial analysis of a good average sample, dried at 100 deg. C.:

Ferric Oxide	84.086
Silica	7.300
Phosphoric Acid	0.288

Analyst, J. L. Beeson

Some of the loose rounded flint pebbles are of a beautiful pink color or are quite pretty specimens of chalcedony and agate.

Many limonite test pits are to be seen on a spur near its west end, in the W. ½ of N. W. ¼ of S. 6, T. 15, R. 9 E. Some of these pits make a good showing of ore while others have only flint nodules and pebbles in them. The ore is gravelly ore with the exception of a few nodules. It is in red and orange loams. That which occurs over the surface is principally hard and sandy. There are also some considerable deposits of limonite, along with breccia, in the S. W. ¼ of N. E. ¼ of S. 36 and N. W. ¼ of N. E. ¼ of S. 24, T. 14, R. 8 E.

The *Leach Limonite Bank* is at the eastern foot of a mountain or in the western edge of a broken valley in the mountains in the N. E ¼ of S. W. ¼ of S. 31, T. 14, R. 9 E. Its ore is mostly high in iron, though some of it is rough or rocky. It is mostly of a very dark color and is probably high in phosphoric acid. Some of it has black waxy spots and some liver-colored spots, and some has cavities that are lined with a black velvety ore. It is mostly in boulders.

The *Pruett Limonite Bank* is near the north-west foot of the mountains in the S. W. ¼ of S. E. ¼ of S. 20, T. 14, R. 9 E. Its ore is exposed for some 75 feet in a trench running north-east and south-west up and down the side of the mountain. It is in large boulders and is of a dark color. It is high in iron and doubtless also in phosphorus.

The *Woodstock Limonite Bank*,on the south side of a spur in the N. W. ¼ of S. E. ¼ of S. 20, T. 14, R. 9 E., is across a hollow from the Leach Bank and about ¼ mile further north. It shows a considerable deposit of ore that is almost entirely in large boulders. Much of its ore however is rough or rocky.

The last two ore banks are on the Weaver Station and Rabbit Town road which passes over the lowest gap in the Jacksonville or Choccolocco Mountains.

A stratified ledge of limonite, 5 to 6 feet thick, that is both sandy and argillaceous, crosses the Jacksonville and Tallapoosa road in the S. W. ¼ of N. W. ¼ of S. 18, T. 14, R. 9 E. Some of it has a slick clayey surface with a reddish pinkish color, while other boulders of it are of a dark brown ore with velvety looking spots. This ledge of ore has been seen at intervals on the side of the mountain for a mile or so to the north-east. A somewhat similar ore or a clayey looking ferruginous sandstone, of a pinkish color, interstratified with greenish tinted sandstones and shales, crops out by the side of the road at a mill on one of the head branches of Cotaquilla Creek in the S. W. ¼ of N. E. ¼ of S. 20, T. 14,

R. 9 E. A manganiferous ferruginous sandstone that is in spots a good velvety limonite crops out here at the milldam.

The Sandstones of these mountains in many places, as on *Chimney Mountain* north-east of Jacksonville, are the best of building and paving stones. They are often of reddish and pinkish colors and so fissile as to split like roofing slates.

To the north-east of Jacksonville, especially within a few miles of the end of the mountains at Piedmont, many smaller faults can be seen branching off in a north-northeast direction from the main overthrust fault along the north-west base of the mountains. Some of these smaller faults extend up into the mountains and one or two, at least, extend through the mountains. They have along them ferruginous breccia and more or less limonite. This ore is mostly a *rough* or *rocky* black waxy ore. It and the ferruginous breccia shows in considerable quantity in a deep red loam on the very top of the mountains along a fault as it crosses the divide between the water of Tallasahatchee and Cottaquilla creeks about in the S. W. ¼ of S. E. ¼ of S. 8, T. 14, R. 9 E.

Limonite and bauxite occur in many places on the south-east side of the mountains on the head waters of Cottaquilla Creek and on the waters of Nancy's Creek.

A bauxite deposit is to be found just to the north-west of a fault on the headwaters of Cottaquilla Creek in the broken valley between the Jacksonville or Choccolocco Mountains and the Terrapin or Ladiga Mountains about in the S. E. ¼ of S. E. ¼ of S. 16, T. 14, R 9 E. It is on a knoll and is in boulders and nodules in a mottled unctuos clay. It is of the red variety, though some of it appears to be of very good quality. Its surface show indicates a considerable deposit. About 300 yards north, there is an other showing of this ore, but it is small. To the east or north-east about one-half mile, there is said to be a large deposit of limonite. This limonite shows still farther north-east in a solid stratified ledge in a gully by the side of the road in the N. W. ¼ of S. E. ¼ of S. 10, T. 14, R. 9 E.

The known bauxite deposits on the waters of Nancy's Creek are about in the S. E. ¼ of S. W. ¼ of S. 33, T. 13, R. 9 E. and the S. W. ¼ of N. E. ¼ of S. 34, T. 19, R. 9 E. The former of these deposits appears to be a large one. Its loose ore has been drifted over a large area covering the side of the mountain and a part of the valley. It is however a red and *rough* or *rocky* ore. The other deposit is said to be not so large but to be of the white variety and of much better quality. The limonite, in large deposits of good dark ore, is said to be in the S. W. ¼ of S. 27, T. 13, R. 9 E. and S. W. ¼ of S. W. ¼ of S. 29, T. 13, R. 10 E.

The sandstones or quartzites on top of the spur just to the south-west of Piedmont have been quarried some for building purposes.

The *Terrapin* or *Ladiga Mountains* are continuous from White Plains to the north-east to far beyond the county limits. They become more and more complicated by folds and faults towards the north-east. At their south-west end just to the north-east of White Plains, they are of a single faulted ridge. Near this south-west end, along the western foot of the ridge in the western part of S. 27, T. 14, R. 9 E., there is a large deposit of limonite. It is mostly a black ore, though some of it is of a liver color. A good average sample of it, dried at 100 deg. C., gave the following partial analysis:

Ferric Oxide	77.220
Silica	12.070
Phosphoric Acid	0.704

Analyst:—J. L. Beeson.

A large deposit of limonite is said to occur at the north-west foot of the mountains in the S. W. ¼ of S. 12, T. 13, R. 10 E. It also occurs in considerable quantity in boulders just to the south-west of Dailey's Station. Some of these boulders however are *rocky* or have cherty looking points and sandy spots.

A bed of roofing slate of very good quality is said to occur on the south-east side of the mountains about in the S. E. ¼ of N. E. ¼ of S. 13, T. 13, R. 10 E. It must be of the upper strata of this formation.

The quartzites and conglomerates of this formation on the south-east side of the Choccolocco Valley are along the tops of short ridges that are just to the south-east of faults.

Just over these rocks, in a deep red loam, there are many deposits of limonite. There is no doubt but that the ore of these deposits has come from the rocks of this formation, but as they are now in a red loam that covers and has been derived, partly at least, from the overlying Aldrich (Beaver) Limestones they will be considered under the head of those limestones. The deposit, however, at the north-east end of the ridge between the Choccolocco Valley proper and the New Davisville Valley is of a stratified ledge of massive boulders that are partly good ore and partly nothing more than ferruginous sandstone, and some of the ore of the deposit on the ridge near the center of S. 35, T. 15, R. 9 E., can be seen sticking to the conglomerates.

A well known chalybeate spring of fine water, on the north-west side of the ridge in the N. E. ¼ of N. E. ¼ of S. 2, T, 15, R. 9 E., flows from a brownish gray sandstone, in places compact and in other places shaly, that overlies a gray ferruginous sandstone that is in places a poor gray or magnetic ore.

(c) *Montevallo* (*Variegated*) *Shales*. (*Hayes' Lower Conesauga and Rome*) *and Aldrich* [*Beaver*] *Limestones*. This formation in its outcrops forms, as a general thing, a broken country of ridges and hills. It occurs both to the south-east and north-west of the mountains of Weisner Quartzites, though that on the north-west sides of the great anticlinals of the mountains is almost completely engulfed in faults. That to the north-west of these mountains is principally of smaller anticlinals with faults along their steep north-west edges. It, all told, is from 1500 to 2500 feet thick and covers nearly 150 square miles of the surface area of the county.

The *Aldrich* [*Beaver*] *Limestones*, make in this county the lower 250 feet, at least, of the formation. Their outcrops are principally along the south-east foot of the mountains and ridges of Weisner Quartzites, having been almost completely engulfed in faults on the north-west sides of the anticlinals of these mountains and ridges. These outcrops, when well drained, give rise to a deep red loam that carries many of the principal limonite banks of the State, though this limonite, as a general thing, at least, has been derived from the upper strata of the underlying formation.

Their red loam as a narrow belt, almost completely surrounds Coldwater Mountain. In this belt, especially near the north-east end of the mountain, there are many limonite banks. This red loam, with the help of loose quartzites and conglomerates from the mountain, forms a very broken country to the west and south-west of the mountain. In this broken country in the S. W. ¼ of

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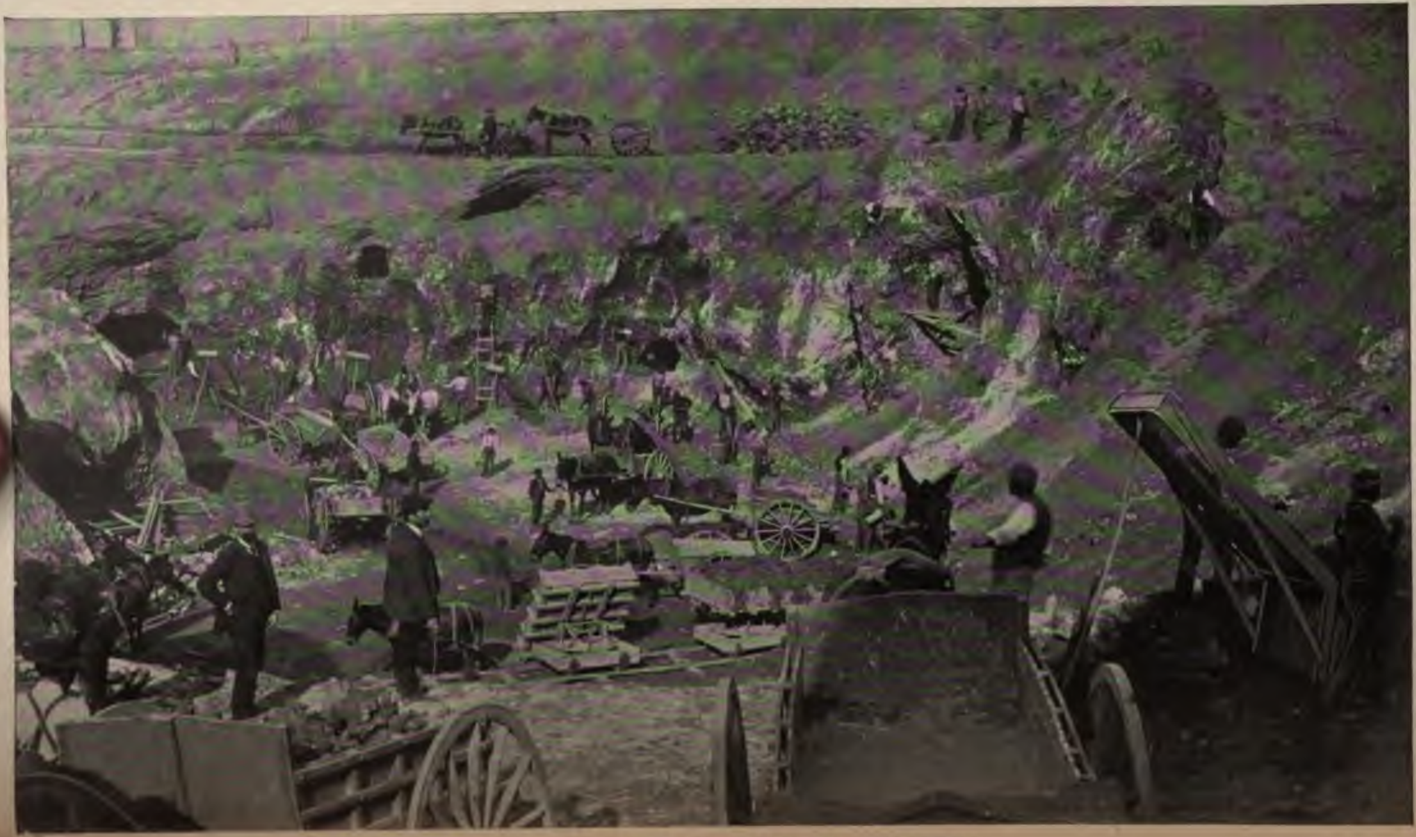


WASHER LIMONITE BANK, ANNISTON, ALABAMA.

N. W. ¼ of S. 21 and also of S. 16, T. 16, R. 7 E., there are some limonite banks.

Large diggings of limonite occur along the foot of the mountain in the S. W. ¼ of S. 12, T. 16, R. 7 E. About ½ mile farther to the north-east or in the N. ½ of S. E. ¼ of S. 12, T. 16, R. 7 E., are the *Skinner Ore Banks*. In these banks, there are two immense diggings, a hundred or so yards apart. Their ore is porous and of good quality. It is in yellowish and orange colored loams. The south-western of these two diggings had on July 9, 1889, reached a depth of 107 feet. Its visible ore was then mainly from 30 to 40 feet below the surface. The diggings showed yellowish and dark brown clay horses with ore on each side of them. These clay horses appear to run north-northeast and south-southwest. The ore of the south-west digging is not altogether as porous as that of the other one in which the ore for the most part is of a very light spongy character, some of it being a *pot-ore*. A good average sample of the ore from these two diggings, dried at 100 deg. C., gave the following partial analysis :

Ferric Oxide	73.643
Silica	13.987
Phosphoric Acid	0.220

Analyst— J. L. Beeson

The *Washer Banks* in the N. ½ of S. W. ¼ of S. 7, T. 16, R. 8 E., are about ½ mile east of the Skinner Banks. These banks have been worked more extensively, perhaps, than any other limonite banks in the State. They are in red and yellow loams at the north-east end of the Coldwater Mountain. The accompanying Plate XXXII is of a photograph of one of the cuts of these banks. Some of their diggings are rich in ore while others show but little ore. Their ore is in boulders and gravels and is of very good quality. It in places runs to the surface, but, as a general thing, the surface loam, 8 to 15 feet deep, carries but little ore. The ore extends beneath the floor of the deepest digging and so there is no telling how deep down it goes. It has along with it some few small pieces of white quartzite and halloysite. The gravelly ore is washed and all of the ore is roasted before being put into the furnace. The ore is for the most part of a liver color, though some of it is black. A good average sample of it, dried at 100 deg. C., gave the following partial analysis:

Ferric Oxide	79.017
Silica	8.249
Phosphoric Acid	0.623

Analyst:—J. L. Beeson.

See also analysis of deposit [2], Maj. Fitzhugh's report, at the end of this chapter.

Limonite diggings and outcrops occur also along the south-east foot of this north-east end of Coldwater Mountain or in the south-west corner of Anniston. It is here however for the most part interstratified with the overlying variegated shales.

The Aldrich (Beaver) Limestones were bored through in a well at the Woostock Furnaces Nos. 1 and 2, Anniston. The following was given by Mr. Walter Crafts as a section of this well:

(3)	Clay and Gravel	32 ft.
(2)	Limestone (Aldrich)	518 ft.
(1)	Sandstones (Weisner); with cavities, gone into	8 ft.

These limestones may not be this thick, as they most probably have a considerable dip in this bored hole.

Limonite has been extensively dug in the south-east part of Anniston in what are known as the *Old Field Banks* in the S. ½ of S. 8, T. 16, R. 8 E., just to the east and north-east of the site of the old ante bellum furnace and just to the east of the present Woodstock Furnaces 1 & 2. These diggings are just to the north-west of the extension to the south-west of the cemetery ridge or spur. They are in red loam along a fault. Their ore is principally in boulders. It does not now make much of a show and it may be that it has been almost exhausted, as it in places appears to thin out as gone down on. A better showing of ore can now be seen farther to the north-east, near the cemetery. It here also is in the red loam with loose quartzite and has been dug to a considerable extent.

Limonite can be seen in many places in the red loam along the south-east foot of the mountains between Oxford and Choccolocco Station.

The *Garrett Limonite Banks*, at the foot of the mountains in the N. W. ¼ of N. E. ¼ of S. 14, T. 16, R. 8 E., have a covering 6 to 8 feet thick of float or of loam with loose quartzites and conglomerates from the mountains. Their ore is for the most part a good cellular ore, though some of it is black and waxy.

The *Nichols Limonite Banks* are in the same *forty* as the Garrett Banks. Their ore is cellular and in large boulders and of good quality. It however appears to be in the overlying Variegated Shales. A good average sample of the ores from these two last named banks, dried at 100 deg. C., gave the following partial analysis:

Ferric Oxide	83.018
Silica	6.746
Phosphoric Acid	0.952

Analyst:—J. L. Beeson.

Some at least of the limonite banks along the foot of the mountains in the N. W. ¼ of S 12, T. 16, R. 8 E. and the N. E. ¼ of N. W. ¼ of S. 7, T. 16, R. 9 E., spoken of under the Weisner Quartzites, are in the red loam over the outcrops of Aldrich Limestones.

The *Widow Blackburn Limonite Bank*, in the N. E. ¼ of S. E. ¼ of S. 7, T. 16, R. 9 E., is on a stratified seam from 2 to 3 feet thick. The ore is of a dark color and is of a fine quality. It is however here in the bank under a yellow loam about 14 feet thick that is barren of ore and hence it would be very expensive to mine.

Limonite, as a good gravelly ore with small nodules, occurs in large quantity in the deep red loam over the sloping south-east sides of the ridges between the Choccolocco Valley proper and the New Davisville Valley, and between this latter valley and the Old Davisville Valley. This ore has along with it in places a honeycomb sandy chert and in other places a fine grain friable quartzite. The ore and quartzite both appear to be more or less water worn. The ore occurs in places all through the loam and in other places only in streaks and pockets. It is in places more or less manganiferous. It has been dug into in a great many places. It shows up well in some of the diggings while in others it is very scarce. It occurs also in places in the valleys, as around Old Davisville on the half-mile line and the western boundary of S. 11, T. 16, R. 19 E. It is here a hard black ore that is also in boulders and nodules. Its outcrops just west of the town make a strip some 15 feet wide, that runs north-west and south-east.

The *Pentegrass or Dunn Limonite Beds* are on the south-east side of the north-east end the ridge in the N. E. ¼ of S. W. ¼ and

N. W. ¼ of S. E. ¼ of S. 2, T. 16, R. 9 E. Their ore is liver colored and of fine quality, though it does not appear to be in very large quantity. It is in north-west and south-east streaks with a dip towards the south-west. It has along with it some boulders of honey comb sandy chert. It butts up against a mulatto *clay horse.* It is washed before shipping. An average sample of it and of the ore of some diggings about ½ mile to the south, dried at 100 deg. C., gave the following partial analysis :

Ferric Oxide	83.167
Silica	5.964
Phosphoric Acid	1.611

Analyst:—J. L. Beeson.

The above analysis shows this ore to be high in both iron and phosphoric acid.

The *Washer Limonite Banks*, Mr. Scarborough's, in the S. E. ¼ of S. E. ¼ of S. 34, T. 15, R. 9 E., are within a couple of hundred yards of the Georgia Percific Railroad. Their ore is of a dark or black color and is in streaks between beds of clay. The ore of the more western of these two banks is in a strip or belt some 50 feet broad and is altogether in boulders. It has been gone down on, when last seen in Aug. 1889, to a depth of about 60 feet. The lower 10 feet has streaks of gray magnetic ore. It conforms in strike and dip to some underlying shales. The ore of the other diggings, some 200 yards farther east, though pricipally of boulders, is partly of pebbles. Its ore is partly liver colored and is of better quality than that of the other bank. It lies between a mulatto clay on the south-east and patches of grayish clay on the north-west. See the following analysis (1).

Old Diggings are in the S. E. ¼ of
T. 15, R. 9 E. Their ore, of a black
and some of it is rough or rocky.
black gravelly ore occurs in the
S. 34, T. 15, R. 9 E. Average sam-
of that of the Scarborough Banks.
gave the following analysis :

	(1)	(2)
....	79.758	78.759
....	10.560	8.972
id...........	0.487	0.914

om the western Washer Bank, the old dig-
in the S. W. ¼ of S. E. ¼ of S. 34, T. 15,

of the ore in the eastern Washer Bank.

the S. W. ¼ of S. E. ¼ of S. 34, T. 15,
at the north east end of the ridge be-
olocco Valley proper and the New
a ledge of massive boulders that are
and partly nothing more than ferrugin-

nite diggings, the *Watty Thompson Beds*,
at and near the foot of a ridge near the
T. 15, R. 9 E. The ore of the upper
y abundant, is of a honey-comb charac-
e lower digging, in large quantity, is in
gravels. It also has some manganese ore.
two diggings is principally of a liver
some of it is black and waxy. It is high
s, as shown by the following analysis of an
ple, dried at 100 deg. C :

Ferric Oxide	77.336
Silica	9.032
Phosphoric Acid	1.074

Analsyst:—J. L. Beeson.

The red loam between the Jacksonville or Choccolocco Mountains and the Terrapin or Ladiga Mountains and along the south-east foot these latter mountains, has in it more or less limonite in a great many places.

The bauxite, spoken of under the Weisner Quartzites, on one of the head branches of Cottaquilla Creek in the S. E. ¼ of S. 16, T. 14, R. 9 E., is in a deep red loam that has most probably come from the limestones that we are now considering.

These limestones make some narrow belts along the faults that run into the Jacksonville or Choccolocco Mountains near their north-east end or into the overthrust fault just to the north-west of these mountains to the south-west of Piedmont,and also some narrow belts to the north-west of these mountains still farther to the south-west. Some of these belts of red loam carry more or less limonite, principally as gravels. In one of them, in the N. W. ¼ of N. W. ¼ of S. 10 and S. W. ¼ of S. W. ¼ of S. 2, T. 15, R. 8 E., there is a considerable deposit of this ore of good quality. It is down on the side of a hill of about 20 acres in extent, the covering loam being almost barren of ore.

The Montevallo (*Variegated*) *Shales*.—These strata form much the greater part of the thickness and surface area of this formation. They make some considerable ridges especially to the north-west of the Weisner Quartzite mountains. They have interstratified sandtones, that are commonly well suited for building purposes, and in places interstratified limonite. One of their limonite deposits, in the S. W. ¼ of N. W. ¼ of S. 25, T. 16, R. 6 E., is manganiferous. Their interstratified limonite was exposed some in grading the streets in the south-western and north-western parts of Anniston. In the south-western part of Anniston, this limonite occurs along a fault and the south-east foot of the north-east end of the Coldwater Mountain. It also occurs to the north-east of this mountain. In both of these localities, it has been dug some. It and the accompanying shales can be seen to be in waves within waves and wrinkles within wrinkles. In the troughs of these waves and over the variegated shales in the north-western part of Anniston, there are some considerable deposits of limonite in a deep red loam along with loose quartzites. This limonite has been dug in a number of places. Some of it is *rocky* or has in it spots of quartzite. It in places has some interstratification that is conformable to the underlying shales. These shales, though in wrinkles and waves, show that they are of a great unsymmetrical anticlinal between Coldwater and Blue mountains or that these mountains are of the same great faulted unsymmetrical anticlinal. These mountains are the intersection of this anticlinal with two other similar anticlinals with north-west and south-east trends. The greater portion of Anniston is therefore over the broken, faulted, unsymmetrical and irregular synclinal trough between the great faulted anticlinal of the above mountains and the one of the south-west end of the Jacksonville or Choccolocco Mountains proper. The variegated shales of this trough can be seen in many places along the graded streets to be in waves within waves and wrinkles within wrinkles.

To the south-east of the Jacksonville or Choccolocco

Mountains, in a low ridge on the north-west bank of the Choccolocco Creek in the S. W. ¼ of S. W. ¼ of S. 29, T. 16, R. 8 E., there is an old quarry in the interstratified sandstones. The sandstones are here a little shaly and have a slight greenish tinge and a talcous feeling.

The *Nichols' Limonite Banks*, in the N. W. ¼ of N. E. ¼ of S. 14, T. 16, R. 8 E., spoken of under the Aldrich (Beaver) Limestones, are in these shales.

Over the outcrops of these shales in many places in the Choccolocco Valley, there is more or less limonite. There is also over their outcrops under and to the north-east of Choccolocco Station a plastic mulatto clay that is extensively used for making bricks, for which purpose it is well suited.

The *Hewitt Limonite Banks*, in the S. E. ¼ of N. W. ¼ of S. 9, T. 16, R. 9 E., and the *Scarborough Limonite Banks*, in the S. E. ¼ of N. E. ¼ of S. 8, T. 16, R. 9 E., are just to the south-east of or just over talcous shales that may be of this formation more or less metamorphosed. The ore of the former of these banks is in small nodules and gravels, and seemingly in large quantity. A bluish spongy chert with cavities lined with quartz crystals occurs along with it. The above Scarborough Banks are two in number. The ore of the more western bank is in a stratified seam that soon gets too deep below the surface to be worked by stripping. Its ore, of fine quality, is of a dark color and is more or less manganiferous. The ore of the more eastern bank is principally in pockets. It is of a spongy character with streaks of very compact ore. Average samples of the ore from the above banks, dried at 100 deg. C., gave the following analyses

	(1)	(2)
Ferric Oxide	64.350	84.086
Silica	15.115	6.020
Phosphoric Acid	1.087	0.800

Analyst:—J. L. Beeson.

(1) Average sample from Hewitt Banks.
(2) Average sample from the Scarborough Banks. Analyst:—J. L. Beeson.

Some little honey-comb limonite, along with some limestones and milky flint, occurs in the variegated shales, more or less metamorphosed, along the edge of the broken country of (a) Talladega (Ocoee) Slates for several miles to the north of New Davisville. This limonite is a gossan and has been dug into in several places in search of copper.

The broken country to the north of Blue Mountain and south of Cane Creek with loose rounded pebbles and nodules of flint and quartzite over its surface and a growth of long leaf pine, is believed to be underlaid, partly at least, by strata of this formation. Many limonite diggings are to be found in this broken country. The limonite of these diggings is for the most part in a mulatto loam under a cover 10 to 15 feet thick of loam with rounded pebbles and boulders of quartzite. *White clay horses* are also shown in these diggings. A ledge of limonite, 6 feet thick, is said to have been struck six feet below the surface in the S. W. ¼ of S. W. ¼ of S. 21, T. 15, R. 8 E. It is covered by a pinkish clay that is believed to be a decomposed pinkish argillaceous shale. The ore of some diggings in the S. E. ¼ of S. E. ¼ of S. 23, T. 15, R. 8 E., is siliceous and of a red brick-dust color. The ore must have been almost solid in some test pits in the N. W. ¼ of S. W. ¼ of S. 21, T. 15, R. 8 E., judging from the quantity that was thrown out of them. The immense diggings in the S. W, ¼ of N. W. ¼ of S. 21, T. 15, R. 8 E., do not show much ore, though immense quantities of ore must have been taken from them. Their ore may now be hid by debris. Similar diggings to these occur at intervals for about a mile to the north or to about Cane Creek. The following analys is is of an average sample of this ore, dried at 100 deg. C :

Ferric Oxide	76.392
Silica	14.957
Phosphoric Acid	0.37

Analyst:—J. L. Beeson.

A good showing of ore is to be seen in an old digging in the N. E. ¼ of S. E. ¼ of S. 17, T. 15, R. 8 E. This ore is covered by some 10 to 12 feet of red loam. It is different from the ore of any of the other diggings in that it is light and porous, Most of the ore of these diggings is of a liver color, though it is very high in phosphoric acid as shown by the following analyses of an average sample, dried at 100 deg. C.:

Ferric Oxide	54.985
Silica	14.366
Phosphoric Acid	1.193

Analyst:—J. L. Beeson.

See also analyses of deposits 3, 4, and 5 at the end of this chapter.

Variegated shales with some interbedded flaggy variegated sandstones and with, in a few places, some thick beds of limestones, form to the south-east of the East Tennessee Virginia and Georgia Railroad, a broken belt of country, of very irregular shape, from 1 to 3 miles broad, that extends from Cane Creek to within about a mile of Jacksonville. This broken country is of ridges that at first or at the south-west end run in a general west-northwest direction and then in a general north-northeast directlon. These ridges are separated from each other by faults. Each of the latter set, as you go towards the north-east, extends a little farther north than its predecessor. The strata of these ridges are believed to have been pushed over from the south-east, from along the great thrust fault just to the north-west of the Jacksonville or Choccolocco Mountains, and dumped down on top of Silurian strata. The strata of the ridges that run in a west-northwest direction extend across the railroad and connect on to an other belt of broken bountry of similar strata. The railroad cuts through them in the cut just south of Weaver Station, where they can be seen to be in waves and wrinkles and just to the north-east of a fault. About ¼ mile to the south-east or in the N. W. ¼ of N. W. ¼ of S. 9, T. 15, R. 8 E., at the south-west foot of the ridge formed by these strata, there is a cave from which flows one of the prongs of Cane Creek. This cave is nothing more than a sub-terranean channel through the ridge for a stream that drains a considerable territory to the north-east of the ridge. The sub-terranean channel is near ½ mile long from the mouth of the cave to where the water sinks at the north-east foot of the ridge in the N. E. ¼ of N. W. ¼ of S. 9, T. 15, R. 8 E. It can be followed for about ¼ mile, to where there is a sink down to it from the top of the ridge. The entering sink at the north-east foot of the ridge does not take in the water fast enough to prevent during freshets the water from rising 30 to 35 feet deep over it. This cave has in it large heaps of nitre earth that were worked for salt-peter during the late war It has also perhaps heaps of bat guano, as it is the home of innumerable bats.

To the south-east a short distance of the sink down to the cave from the top of the ridge, there is an other sink on top of the ridge, that leads down to an other cave, with a comparatively level floor, some 60 feet below the surface. This cave also has in it heaps of nitre-earth that were worked for salt-peter during the late war. To get the earth out, a shaft was sunk down to the cave. This cave consists of a room about 180 ft. x 75 ft. and from 10 to 20 feet from floor to ceiling without a single support, with passages extending out from it in all directions to smaller rooms. It has some beautiful stalagtites and stalagmites, though the other cave has none.

The mouth of the first of these two caves or of the sub-terranean channel is at the foot of a bluff of limestones from 30 to 40 feet high. In this bluff just to the west-northwest of the mouth of the cave, there is a quarry from which rocks were gotten for building piers, abutments, and culverts along the railroad. The limestones of this quarry are mainly of a deep blue color, though some of them are of a gray color. The quarry has also in it some yellow ochreous calcareous rocks or impure limestones and some chocolate colored shaly rocks. It also shows between the different compact rock ledges, or along the planes of stratification, thin seams of a dull yellowish clayey calcareous cherty or siliceous rock that on weathering becomes very light. These thin seams stick out prominently from the weathered rocks. They give rise to the loose small pieces of yellowish sandstone that is scattered over the surface. There is an other quarry in these limestones several hundred yards to the south-east.

These limestones, in outcrops about ¼ mile south-east of Weaver Station, were quarried in several places for a flux in the Woodstock Furnaces, Anniston. They were doubtless found too siliceous for this purpose, as they were not used to any great extent. Over the surface, around these outcrops, there are loose small gray and yellow sandstones.

To the south-east of this broken country of Variegated Shales, etc., between it and the identified (f) Trenton strata (Rockmart Slates, etc.,) of the *Dark Corner*, there is a broken belt of country of a black carbonaceous looking shale that on weathering becomes of a dull dark yellow or yellowish color. Instead of being Cambrian or of this formation, it may be, so far as looks are concerned, and no fossils have been found in it, either (3) Lower Silurian (Trenton) strata or (7) Upper Sub-carboniferous (Oxmoor (Floyd) Shales). If not of this formation or of the overthrust strata, it is believed to be of the (3) Lower Silurian (Trenton) strata of the Dark Corner to the south-east.

The Variegated Shales of the above belt can be seen along their raggad north-west edge to overlie (e) Siliceous (Knox) Dolomite strata. The Weaver Station and Jacksonville road passes along this ragged north-west edge or over the points of the ridges of Variegated Shales and Sandstones.

The limestones of this formation form a considerable knoll that is covered with red cedar in the S. E. ¼ of S. 27, T. 14, R. 8 E. They are a dark blue color with irregular streaks and concretions of calcite. They show on their weathered surfaces irregular interstratified sandy seams of a dull yellowish gray color along which they split into slabs of from ½ to 2 inches thick. They have been quarried some for building purposes and for culverts. They in places weather into yellowish shales. They have been thrust over towards the north-west until they overlie (e) Siliceous (Knox) Dolomite. To the south-east of or over them, there are shales with interbedded impure limestones that in places, at least, weather into shales.

A lime kiln was blasted out in a bluffy outcropping of the above limestones in the N. W. ¼ of S. E. ¼ of S. 26, T. 14, R. 8 E. The limestones blasted out were burnt in the kiln. They were doubtless found too impure for this purpose, as the lime burning didn't go beyond the experimental stage.

Several springs whose waters are said to have medicinal virtuesoccur in the outcrops of the Variegated Shales and Sandstones in the S. W. ¼ of S. 35, T. 14, R. 8 E. These strata also carry in this same quarter section a deposit of very good liver colored limonite. Two test pits have been sunk in the *William's Limonite Bank* in the E. ½ of S. W. ¼ of N. E. ¼ of S. 36, T. 14, R. 8 E. The ore of the south-eastern of these pits, a small pit, is nearly all rocky or siliceous, while that of the other pit is in large boulders and of good quality.

From south-west of the above springs on to within a mile of Jackonville, the Variegated Shales and Sandstones can be seen in many places to be in waves and wrinkles. They here form three ridges of faulted anticlinals, with a general north-northeast and south-southwest trend, that gradually die out on the south and north The most eastern of these ridges is in line with the quartzite spur just east of Jacksonville and the most western one with the hill or ridge, of (e) Siliceous (Knox) Dolomite, on which Jacksonville stands.

The Variegated Shales and Sandstones to the north of the East Tenn., Va., & Ga. R. R., form a broad low anticlinal ridge that extends from this railroad nearly two miles north of Weaver Station to just south-west of the Anniston and Cincinnati Railroad several miles south of Alexandria, and a high ridge, with a great overthrust fault along its north-west edge, that extends from about north-west of Alexandria to north-west of Jacksonville.

A porous limonite in considerable quantity occurs on the former of these ridges in the S. W. ¼ of N. E. ¼ of S. 32, T. 14, R. 8 E. Just to the south-west of this limonite, there is an outcropping of the blue limestone. Still farther to the south-west, on the side of the ridge in the N. E. ¼ of S. E. ¼ of S. 1, T. 15, R. 7 E., there is an outcropping of the yellow ochreous sandstone that has been used some for building chimneys.

Both of the above ridges gradually die out at their ends where their unsymmetrical anticlinal structure can most plainly be seen. Their strata gradually disappear or dip under overlying strata at these ends.

The strata of the latter of the above two ridges near their south-west end are pushed over on top of the (j) Oxmoor Shales and Sandstones (Floyd Shales) to the north of their ridge for about ¼ mile or until they form a narrow broken connecting link between their ridge and the southern end of a smaller ridge of similar strata that extends a couple of miles north-northeast to Tallaseehatchee Creek. These pushed over strata therefore cuts off to itself or makes a distinct area of the most western point of the great body of (j) Oxmoor Shales and Sandstones (Floyd Shales) to the north of this ridge. On the side of the ridge to the south of the above detached area, there are outcrops of the blue limetsones, Aldrich or Beaver, in the lower part of this formation.

The blue limestones at the top of this formation and of the overlying formation can be seen in several places to the south-east of the ridge. These last named limestones have calcite streaks and are banded. They weather into shales and thin slabs.

The strata of this ridge can be seen in many places to be in waves and wrinkles. They can be seen at Francis' Mill, in the south-west corner of S. 15, T. 14, R. 3 E., where cut through by Little Tallaseehatchee Creek, to overlie the (j) Oxmoor Shales and Sandstones (Floyd Shales) along the big overthrust fault that occurs along the north-west side of the ridge. The fault here is away up on the north-west side of the ridge and it gets higher up on the ridge towards the north-east. The pink and yellow sandstones have a quarry in their outcrop on the south-east side of the ridge west of Jacksonville or about in the N. W. ¼ of N. E. ¼ of S. 15, T. 14, R. 8 E.

Though this ridge dies out about north-west of Jacksonville, another one of similar strata starts up in about 4 miles to the north-east and continues on to within a mile of Piedmont. A fine section of its variegated shales and sandstones, with interbedded blue limestones, can be plainly seen where cut through by Tallaseehatchee Creek in the S. W. ¼ of S. 20, T. 13, R. 9 E. The banded blue limestones at the top of the formation and of the overlying formation form a narrow valley along the south-east foot of the ridge. They often weather into shales and flags.

This and the overlying formation and the (e) Siliceous (Knox) Dolomite end Chert formation, make a very broken country for several miles to the south-west of Piedmont, between the above ridge and the Jacksonville or Choccolocco Mountains. They together make belts, separated by faults, that run diagonally across the country from the great overthrust fault up on the side of the mountains and a fault just to the south-east of the above ridge. This formation forms the north-west edges, the most elevated and broken parts of the belts. Its strata at the south-west end of the most north-west of these belts or near the center of the S. E. ¼ of S. 15, T. 13, R. 9 E., can be seen to gradually sink or disappear as an unbroken anticlinal under the overlying formation to the south-west. Some of the imbedded limestones here are variegated.

The Variegated Shales and Sandstones extend up the side of the mountains to the hotel at the Piedmont Mineral Spring in the S. E. ¼ of S. 14, T. 13, R. 9 E. The great overthrust fault here then runs along close to the hotel or fully half way up the side of the mountain. This mineral spring is of fine chalybeate water. Its water may possess other mineral properties.

The golden yellow shales at the top of this formation (Hays' Bottom Connesauga) are very fossiliferous (Olenoides, etc.) where cut through by the East and West Railroad in the N. E. ¼ of S. 12, T. 13, R 9 E. From an outcropping a few steps to the north-east of the sandstones (top of Hayes' Rome) just under these shales, there flows a very fine big spring.

Piedmont is on two belts of Variegated Shales that are separated from each other by a fault. They bend to the south and west, one of them around the mountain spur just to the south-west of Piedmont and the other around the north-east end of the Jacksonville or Choccoloco Mountains. This latter belt, on top of its ridge in the south-eastern part of Piedmont, has furnished some flaggy sandstones for building purposes. It starts up just to the east of the East. Tenn., Va. & Ga. R. R.

depot in a ridge that extends to the north-east of Nancy's Creek. To the north-west of this ridge, there are two other ridges of the Variegated Shales and Sandstones. One of them extends from Mill Creek, in the north-west edge of Piedmont, to the north-east to the county line; the other one is merely a short ridge down in the fork of Mill and Nancy's creeks. The variegated sandstones of the former have been quarried at its south-west end on Mill Creek, also on the west bank of Nancy's Creek and also still farther to the north-east, near the county line.

The variegated shales, with a few thin bedded sandstones, form a wide belt that crosses diagonially the narrow valley along Nancy's Creek between the Jacksonville or Choccolocco and the Terrapin or Ladiga mountains.

The top strata of this formation have been seen in a couple of narrow belts in the broken country of (e) Siliceous [Knox] Dolomite and Chert to the north-east of the Sulphur Springs. These belts were seen in S's 9 and 15, T. 13, R. 8 E. They are of the crests of unsymmetrical anticlinals with a north-northeast and south-southwest trend.

This formation also forms to the east of the Colvin Mountain, on the head waters of Ball Play Creek, a narrow broken valley that opens out into the great body of [d] Coosa [Flatwood] Shales along the Coosa River. In this valley at its mouth, on a low ridge in the N. E. ¼ of S. W. ¼ of S. 33, T. 12, R. 9 E., there is in the upper part of the formation an outcrop of a hard black slaty rock that is bituminous enough to burn, so said, when thrown into the fire. The interbedded limestones in an outcrop about ¼ mile to the south or in the S. W. ¼ of S. W. ¼ of S. 33, T. 12,

R. 9 E., are said to carry some argentiferous galena in thin streaks. These strata may be of the overlying [d] Coosa [Flatwood] Shales and Limestones.

The Variegated Shales and Sandstones occur in a detached patch just south of Allsop P. O. at the north-east end of the Colvin Mountain. They are just to the east of or just over a north and south ledge of white quartzite, with some small pebbles in places, that doubtless belongs to the underlying [b] Weisner [Chilhowee] Sandstones. The strata hereabouts are badly faulted.

(d) *Coosa [Flatwood] Shales [Contemporaneous with Hayes' Connesauga.]* This formation in Calhoun county, from 300 to 500 feet thick, does not make any flatwoods, the only type of it that is distinguished on the State Geological Map from the [c] Montevallo [Variegated] Shales. It however covers, in narrow belts along the south-east edge of the [c] Montevallo [Variegated] Shales, considerable of the county area. It embraces the banded blue limestones that weather into shales, slabs, and thin bedded strata, and the shales, most commonly yellowish, just over the [c] Montevallo [Variegated] Shales, that were often spoken of under that formation as occurring at the top of the formation.

The impure banded blue limestones form a bluff nearly 100 feet high in the southern part of the N.W. ¼ of S. 30, T. 16, R. 9 E., along the great thrust fault to the south-east of the Choccolocco Valley. This outcropping dips under or is covered by the [a] Talladega [Ocoee] Slates of the broken country to the south-east.

These blue limestones with calcite streaks, weathering into thin slabs and shales, can be seen in many places to the south-east of the ridge of [c] Montevallo [Variegated] Shales that starts in to the north-west of Alexandria and ends to the north-west of Jacksonville.

They can also be seen in many places between Merrilton and Piedmont. There is a quarry in their top strata on the East and West Railroad in the S. E. ¼ of N. E. ¼ of S. 20, T. 13, R. 9 E. In the broken faulted country to the north-east, or in the S. E. ¼ of S. 15, T. 13, R. 9 E., they show as three ledges of about 20 feet each in thickness that are separated from each other by 75 to 80 feet of debris, doubtless covering shales. These outcrops split easily into thin slabs along interstratified clayey seams. They are just to the north-west of a fault.

The top strata of the formation, massive blue limestones, form high ledges across Terrapin Creek in the N. W. ¼ of S. 34, T. 12, R. 10 E.

The hard black bituminous slaty rocks with their imbedded limestones in the narrow broken valley on the head waters of Ball Play Creek or in the N. E. ¼ of S. W. ¼ of S. 33, T. 12, R. 9 E. are most probably of this formation.

[3] *Lower Silurian.* This group, from near 4000 to over 5000 feet thick in Calhoun county, is in irregular belts with a general north-east and south-west direction. It covers nearly 200 square miles of the surface area of the county. Its extent, etc., however, can be best seen on the map. It is of the [e] *Pelham Limestones* [*Trenton and Chazy*] and [d] *Siliceous* [*Knox*] *Dolomite and Chert*, including the Red Land [Eastaboga] Limestone or Upper Connesauga.

[d] *Siliceous* (*Knox*) *Dolomite and Chert* [including the Red Land [Eastaboga] Limestone or Upper Connesauga.] This formation, from 3000 to 4000 feet thick, covers most of the surface area of the [3] Lower Silurian strata in Calhoun county. It makes considerably over ¼ or between 175 and 200 square miles of the sur-

face area of the county. It is in several irregular belts that, commencing with the most north-western one, are as follows: The belt that extends from Duke's Station on the south-west to the county line on the north-east, the belt just to the north-west of the Jacksonville or Choccolocco and Terrapin or Ladiga mountains, and the north-east point of a belt south-east of the Jacksonville or Choccolocco Mountains. It also includes a part of the broken country at the north-east end of the Colvin Mountain. The strata in trying to bend around the end of this mountain were badly faulted. They have, near their bottom, some massive quartzites.

The belt that extends from Dukes' Station to the north-east to the county line covers some 45 square miles. It is, as a whole, a broad flat faulted unsymmetrical anticlinal that is made up of smaller unsymmetrical anticlinals and synclinals. Some of its anticlinals and synclinals have a more northward trend than the general direction of the belt, and so these extend across the belt in a north-northeast and south-southwest direction. The belt is bounded on the north-west by a great overthrust fault and on the south-east by a composite fault with perhaps some gaps in it. This composite fault is made up partly, at least, of faults that run up into the belt along the steep north-west sides of the the smaller anticlinals. These smaller faults have along them points of this formation that extend south-southwest beyond the belt and points of other formations that extend north-northeast up into the belt. The south-east edge of the belt is thus made jagged. The north-west edge is for nearly all of its distance along an overthrust fault. The strata of this edge are thrust more or less over on (f) Pelham Limestones

(Trenton and Chazy) and (i) Fort Payne Chert for several miles at its south-west end and then for some 7 miles to the north-east over on the (j) Oxmoor Shales and Sandstones (Floyd) along Ohatchee Creek.

Lime sinks occur in many parts of this belt. Some of them drain considerable territories. *Baryte* (*Heavy Spar*) has been seen in this belt in some half-dozen places. This mineral crops out in the Gadsden and Jacksonville road in the S. E. ¼ of N. E. ¼ of S. 35, T. 13, R. 7 E. It is said to be in considerable quantity just to the north-east of this point. It occurs on Mr. A. Tullis' land near Tampa or in the N. E. ¼ of S. E. ¼ of S. 6, T. 14, R. 8 E., in loose nodules and small boulders through a deep red loam, for a distance of a couple of hundred yards and to a depth of some 20 feet. It is for the most part of good quality, though some of it is stained a dark color. It carries some galena, perhaps argentiferous, in spots. It has associated with it some very good kaolin that is said to be 10 feet thick.

Baryte of good quality, though in small quantity, was also dug, along with limonite, from a test pit on top of a high hill in the piney woods in the S. E. ¼ of S. E. ¼ of S. 31, T. 13, R. 8 E.

These baryte outcrops have all more or less limonite along with or near them. They overlie dolomites, and are in the red loam from the disintegration of these rocks in which the mineral doubtless exists. The kaolin shows itself also in the W. ½ of S. W. ¼ of S. 5, T. 14, R. 8 E., in a small cut on the East and West Railroad and in a pit just south of this railroad, where it is said to have been dug down into a depth of 10 feet. The gritless unctuous clay in the railroad cut has been used some for polishing the brass on the engines. A baryte outcrop occurs also in the S. W. ¼ of N. W. ¼ of S. 26, T. 13, R. 8 E.

Limonite in greater or less quantities has been seen in T. 13, R. 8. E., in N. W. ¼ of N. E. ¼ of S. 19; S. W. ¼ of S. E. ¼ of S. 20; N. E. ¼ of S. 10; S. W. ¼ and S. E. ¼ of S. 12; and N. E. ¼ of S. 13; and in T. 13, R. 9 E., in N. W. ¼ of S. 10. Some of it is a needle ore, furnishing fine cabinet specimens, and some of it is ochreous with velvety spots. That in the S. E. ¼ of S. 12 and N. E. ¼ of S. 13 is in large boulders and in large quantity It is of very good quality. as shown by the following partial analysis of an average sample, dried at 100 deg. C:

Ferric Oxide	75.269
Silica	16.596
Phosphoric Acid	0.237

Analyst:—J. L. Beeson.

There is also some limonite in the S. ½ of N. W. ¼ of S. 7, T. 14, R. 8 E., in red loam at the south-west end of one of the longest of the jagged points that extend out from this belt to the south-west.

The belt of this formation just to the north-west of the Jacksonville or Choccolocco and Terrapin or Ladiga mountains includes the greater part of the outcrops of this formation in Calhoun county. It embraces some 125 square miles, though perhaps one-half of it is of the Red Land (Eastaboga) Limestone, the upper part of Hayes' Connesauga. This belt is of very irregular outlines. It is cut in two by narrow strips of (e) Montevallo (Variegated) Shales and (d) Coosa (Flatwood) Shales just to the south-west of Piedmont and almost cut in two by these same strata to the north of Weaver Station, and, to the north of the East and West Junction or Merrelton, it is connected with the other belt of this formation to the north-west. It is, as a whole, of broken and crumpled up strata of a broad faulted unsymmetrical synclinal that is made up of smaller unsymmetrical anticlinals and synclinals that in places cross it in a general north-northeast and south-southwest direction and that have in places, at least, faults along them.

At the north-east end of this belt or in the N.½ of S.1, T.13, R. 10 E , there is a large deposit of limonite, some ¾ mile long. It has a great deal of good ore, though its good ore is so badly mixed with rough or cherty ore as to have to be picked out with the hammer and hand, which would add to its cost. Its bottom ore or that which crops out along the nort-west edge of the deposit or along the top of the ridge is, as a general thing, of a better quality than the top ore which has in it a row of rough cherty boulders. This deposit has been dug into in several places and all of its ore below the surface, so far as seen, was in boulders, though there is some gravelly ore scattered over the surface. This deposit is suddenly stopped or covered up on the north-east by the loose white quartzites of the mountains along the great thrust fault. An average sample of the ore of this deposit, dried at 100 deg. C., gave the following analysis:

Ferric Oxide.............	77.00
Silica....................	11.88
Phosphoric Acid.........	1.60

Analyst:—J. L. Beeson.

Along with the quartzite on the side of a mountain spur in the S. E. ¼ of S. E. ¼ S. 1, T. 13, R. 10 E., there are boulders of impure limonite. Boulder limonite, mixed with quartzite, occurs also at the north-east end of a ridge on the south-west bank of Terrapin

Creek in the S. E. ¼ of N. W. ¼ of S. 12, T. 13, R. 10 E. Limonite, in gravel patches in red loam, occurs to the south-west to Piedmont.

This formation, in the broken country between the E. T., Va., & Ga., R. R. and the Jacksonville and Choccolocco Mountains for several miles to the south-west of Piedmont, is in several narrow belts between Cambrian strata. The cut where one of these belts strikes the railroad in the S. W. ¼ of S. E. ¼ of S. 12. T. 13, R. 9 E., shows the strata to be badly broken up and to be bent over towards the west-northwest. The great body of *Red Land* to the south-west are in a series of low flat ridges with a general north-east and south-west direction. These ridges most probably correspond to waves or anticlinals in the strata that may in places be separated by faults. This *Red Land* has in it many big springs, some sinks, and some good deposits of limonite. It is bounded on the north-west for several miles, or from north-west of Merrelton to north-west of Jacksonville, by a great overthrust fault along which its strata are thrust over on (j) Oxmoor Shales and Sandstones (Floyd). It is bounded on the south-east also by a great overthrust fault along which the (b) Weisner (Chilhowee) Sandstones of the Jacksonville or Choccolocco Mountains are thrust over on top of it. Along this fault or next to the foot of the mountains here. there is a low ridge of the upper or cherty strata of the formation.

Limonite deposits have been dug into in a number of places in the broken country along the foot of the mountains in the S. E ¼ of S. 12, T. 14, R. 8 E. The ore is mostly brown and liver colored. Some of it is botryoidal and some fibrous. The main ones of these diggings are included in what is known as the *Windom* and *Walker limonite banks*.

The ore of the *Windom Bank* appears to be mostly near the surface. It showed in one digging, that was partly filled with water, a thickness of about 15 feet above the water and is said to have extended down some 6 feet under the water. It is in boulders and most of it has white spots of sandy matter. It is in a stratified layer in a straw colored loam. In another digging, just east of the above, there is a dirty manganese ore 4 to 5 feet thick. The manganese here stains also a stratified sandstone. In other diggings about 100 yards to the south-east, there is a reddish shaly argillaceous ore in large boulders. The impure ore is in large quantity in another digging some 35 to 40 yards farther east where it is in somewhat of a stratified layer with a thickness of about 45 feet. It is also in large quantity in still another digging near the last one. It is said to have about the following partial analysis:

Ferric Oxide, about	43.00
Alumina, about	17.00
Silica, about	28.00

The *Walker Bank* is a couple of hundred yards to the south-west of the Windom Bank. The most of its visible ore is deeper below the surface. Its ore is covered from 3 to 20 feet by residual loam. The ore is in pockets and much of it is rocky or siliceous. An ore ledge about 3 feet thick was visible in the bottom of one of the diggings. In this digging, there was some white *clay-horses* and some loose white quartzites. These loose quartzites, more or less water worn, occur along with the ore in another digging some 200 yards to the west. The ore here however is not very abundant and is partly rocky or siliceous. The ore of other diggings some 150 yards to the north appears to be confined to the bottom of the diggings. That of a large digging some 30 to 40 yards still farther to the north-west is somewhat shaly and in irregular stratified streaks. It is in large quantity.

More impure manganese ore shows in a digging some 200 yards to the north of that seen in one of the diggings of the Windom Bank. It is here nothing more than a thin crust or stain on a sandstone.

The ores of the Windom and Walker banks are of very good quality, as shown by the following partial anaylsis of an average sample, dried at 100 deg. C :

Ferric Oxide	74.337
Silica	12.938
Phosphoric Acid	0.616

Analyst:—J. L. Beeson.

Bauxite has been exposed in several shallow test pits a short distance to the north-west of the Windom Bank. These pits are within a distance of about 250 yards in a general north-east and south-west direction. They are not deep enough to show much as to the quantity and character of the ore. In one of them, the ore is exposed to a thickness of 12 to 14 feet and in another to a thickness of about 25 feet, though in neither of these pits is it exposed to its full unknown thickness. They show both red and white ore and in both pits the white ore seems to be on top and the red ore the thicker. The matrix is a straw colored sandy loam. These pits appear to be along the top or north-west side of an anticlinal. Some of the pisolitic concretions are full of a fine ferrugineous dust while some of them are empty. This ore, as it shows here on the outcrop, is not of the best quality. The most of it is too siliceous and some of it is very high in iron, as can be seen from the following analyses:

	[1]	[2]	[3]	[4]	[5]
Alumnia..........	45.94	47.52	41.38	41.00	48.92
Ferric Oxide.......	11.86	19.95	0.85	25.25	2.14
Silica.............	18.87	7.73	23.72	10.25	21.08
Water, Combined..	21.20	23.57*	23.72*	21 97*	23.86*

*These include the hydroscopic moisture

[1] An average of two analyses of the red ore on the outcrop. Analysts:—R. Swain Perry and Chemist of the U. S. Geogological Survey.

[2] An average of two analyses of the white ore on the outcrop. Analysts:—Same as (1).

[3] An average sample of the ore on the outcrop. Analyst:—W. B. Phillips.

[4] The red variety. Analyst:—Same as [3].

[5] The white variety. Analyst:–Same as [3] and [4]

Limonite, in considerable quantity, occurs as gravels in the red loam of the rolling country, old fields, between the Windom and Walker banks and Jacksonville. This gravelly ore appears thick enough in places to be workable. It also occurs in the red loam to the north-west of Jacksonville. The strata of this red land, along the Jacksonville and Weaver Station road or along the overthrust fault several miles south-west of Jacksonville, underlie the (c) Montevallo (Variegated) Shales, pushed over on top of them.

The beautiful Alexandria Valley is an anticlinal valley, the cherty ridges to the south-east of it, between it and Peaceburg, being of a synclinal that gradually dies out to the north-east. This valley is bounded on the north-west, forthe most part, by a great overthrust fault that thrusts its [valley] strata over on top of [j] Oxmoor

Shales and Sandstones [Floyd]. It carries some very good deposits of gravelly limonite. One of the largest of these deposits is around the Gladden residence in the N. W. ¼ of S. W. ¼ of S. 33, T. 14, R. 7 E. The ore here appears to be confined to within a few feet of the surface. It is a gravelly ore with some few boulders and is of good quality. See analysis of deposit 10 at the end of this chapter.

To the west of this valley, between it and the overthrust fault to the south of Rockpile Mountain, there is a broad ridge, some ¾ mile broad, of the upper cherty strata of the formation, that is covered with a very fine growth of long leaf pine.

Limonite is said to be in a considerable deposit on the cherty ridge in the N. W. ¼ of N. W. ¼ of S. 9, T. 15, R. 7 E. See analysis of deposit 9 at the end of this chapter. It occurs, as gravels, in the red loam about ¼ mile north of Peaceburg. To the south-east and south-west of Peaceburg, the country is very broken. It was originally covered with a growth of long leaf pine that has been converted mostly into charcoal for the Anniston furnaces. It seems, in a general way, to be made up of a couple of broad synclinals and anticlinals with a north-east and south-west trend, that are made up of smaller synclinals and anticlinals, and these in turn of waves, wrinkles, etc. Limonite occurs in many places along the south-east edge of this broken country. It shows in patches of gravelly ore in the red loam along the road between Weaver Station and Anniston. Along this south-east edge of the belt, there is in places an overthrust fault along which the [c] Montevallo [Variegated] Shales have been thrust over the edge of this belt. This can be seen on the Anniston and Cincinnati Railroad and farther to the south-west.

The *Edmundson Limonite Banks*, two in number, near the center of the N. E. ¼ of S 36, T. 15, R. 7 E., are in a broken country with a growth of long leaf pine. Considerable ore is visible in the more northern of these banks. It is in boulders in a red loam. Some of it however is rocky or cherty. The ore of the other bank, about ¼ mile to the south-west, is a gravelly ore, in considerable quantity, in a red loam. The ore of both banks is compact and is of very good quality, as shown by the following partial analysis of an average sample, dried at 100 C.:

Ferric Oxide	74.855
Silica	17.194
Phosphoric Acid	0.332

Analyst:—J. L. Beeson.

See also analysis of deposit 6 at the end of this chapter.

Limonite banks are said to occur in the S. W. ¼ of S. E. ¼ of S. 25, T. 15, R. 7 E.

The *Pine Grove Church Limonite Beds* are in the S. W. ¼ of N. E. ¼ of S. 11, T. 16, R. 7 E. These diggings do not show now much ore, though, judging from their size and from the large quantity of gravelly ore in the screenings, they must have yielded a vast amount of ore. The ore that has been left would be very expensive to mine, as it is covered by from 10 to 25 feet of red loam, with loose rounded flint pebbles, that is almost barren of ore. The surface however in many places near these beds is covered with the gravelly ore along with the loose rounded flint pebbles. The ore of these beds is of red, liver, and dark colors. It is most compact, though some of it is porous. An average sample of it, dried at 100 deg. C., gave the following partial analysis:

Ferric Oxide	72.538
Silica	17.251
Phosphoric Acid	0.323

Analyst:—J. L. Beeson.

Other limonte beds are said to be in the N. E. ¼ of S. E. ¼ of S. 4, T. 16, R. 7 E.

The *Leatherwood Limonite Banks*, near Leatherwood Station on the A. & C. R. R., are in the N. E. ¼ of N. E. ¼ of S. 23, T. 15, R. 7 E. Their ore is said to be mostly small lump ore. See analysis of deposit 7 at the end of this chapter.

There is another reported ore deposit, the *Cooper Bed*, north of the Leatherwood Banks. Analysis of deposit 8 at the end of the chapter is of this ore.

The gravelly limonite shows in patches along the south-east edge of the belt in S's 3, 4, 5, 9, 8, and 17, T. 16, R. 7 E.

Near the north-west edge of the belt or in the northern part of the S. E. ¼ of S. 29, T 15, R. 6 E., there is some limonite over the surface, though it is mostly rocky or cherty. There is also some little limonite over the surface near the county line in the S.W.¼ of S. W ¼ of S. 21, T. 16, R. 6 E., and extensive deposits of this ore are said to be in the N. W. ¼ of S. 27, T. 16, R. 6 E. Lime sinks and big springs are numerous and gravelly limonite beds are not uncommon in this south-west end of the belt.

A small detached patch or knoll of this formation in the south-east corner of S.26, T.15, R. 5 E., has an outcropping of baryte (heavy spar). This mineral occurs here, as it usually does, at the top of the formation.

The belt to the south-east of the Jacksonville and Choccolocco Mountains is of the north east point of a long, broad belt or unsymmetrical faulted synclinal that lies principally to the south-west of the county, gradually ending on the north-east near Choccolocco town. It, within this county, covers about 15 square miles and is principally of the lower or Red Land [Eastaboga] Limestones. This area includes a few square miles, principally of the upper or cherty strata, to the south-west of Coldwater Mountain where the belt extends northward into the county.

[f] *Pelham Limestones* [*Trenton and Chazy*]—This formation of rocks from 1000 to 1800 feet thick in Calhoun county is entirely to the north-west of the Jacksonville or Choccolocco Mountains. It, with a few exceptions, is in narrow belts that are just to the north-west of ridges of the [g] Red Mountain [Clinton] Formation and [i] Fort Payne Chert, and just to the south-east of faults. These belts are made up of narrow valleys, along the foot of the ridges, and of parts of the steep north-west sides of the ridges. They are often repeated, sometimes a half-dozen times. They point in towards Duke's or the crossing of the A. & C. and E. & W. railroads, from every direction except the north-west. They end by being engulfed in faults. Their strata, being comparatively soft and valley making, do not show up in a great many places. Their surface area in the county is less than 20 square miles. Their extent, and location, however, can be best seen on the State Geological Map, though all of the belts could not be shown on that map.

The name Pelham [Trenton] Limestones is not appropriate to the formation in its most south-eastern and south-western exposures in the county, as in these exposures the strata are almost wholly of shales and slates. Hayes' Rockmart Slates would be a more appropriate name for these exposures. The limestones, therefore in a general way, give away to the shales and slates towards the south-east and south-west. These limestones, though usually quite pure and of a dark blue color, are often of a light sandy or sugary appearance on the weathered surfaces with sometimes furrows and sometimes hack-like marks. Their weathered surfaces also often show clayey looking splotches and interstratified seams, and occasionally cherty seams and nodules. These limestones, however, usually burn very readily into the best quick-lime. They are fossiliferous, with *maclurea magna*, etc., though no fossils have ever been seen in the shales and slates of this county. These shales and slates are of a variety of colors on the weathered surfaces, though on a fresh surface they are mostly black. They, in several outcrops, appear to be very good roofing slates.

The limestones in an outcropping in the S.E. ¼ of S.E ¼ S. 15, T. 15, R. 6 E., have some thin streaks of *galena* and *blende*. The galena must occur in them also in the S. E. ¼ of S. E. ¼ of S. 10, T. 15, R. 6 E., as it was picked up there loose over their outcrops. These limestones have been quarried some for building stones in the western part of the S. W. ¼ and in the S. E. ¼ of N. W. ¼ of S. 33, T. 13, R. 7 E.

The "*Rock Mountain*," in the S. W. ¼ of S. 13, T. 13, R. 7 E., is a bluff of these limestones about ½ mile long and 100 feet high. It is said to have a cave in it with deposits of nitre-earth that were worked during the late war. This bluff is covered by (e) Siliceous [Knox] Dolomite and Chert that has been thrust over towards the north-west on top of it.

The reported old pits in the N. E. ¼ of S. 14, T. 14,

R. 7 E., dug for galena, so said, are doubtless in outcrops of these limestones.

The "*Old Lead Mines*," in the S. E. ¼ of S. W ¼ of S. 7, T. 14, R. 8 E., are in the outcrops of a light gray limestone of this formation. This limestone has calcite streaks and on the weathered surfaces a hacked appearance and a cherty look with raspy sandy splotches. It weathers also into pits and furrows, These old mines consists of several open cuts that were dug during the late war. Considerble galena is reported to have been taken from them. The largest one, around which there were found some fine specimens of galena, was partly filled with water at the time visited and hence its galena could not be seen in place. Its galena, however, is said to occur for about 10 feet in a stratum about 2 feet thick. No specimens of galena were found around any of the other diggings.

The limestones of this formation show up well along the creek near Tampa or in the southern part of S. 6, T. 14, R. 8 E. In these outcrops, there is a *big spring*, and below the *spring* the creeks sinks and rises again in what is known as the *big blue spring*. These limestones, in a bluff on Tallaseehatchee Creek in the N. E. ¼ of N. W. ¼ of S. 35, T. 13, R. 8 E., are extensively quarried and bunt into quicklime. They have also been quarried some and burnt into lime in the S. E. ¼ of N. W. ¼ of S. 24, T. 13, R. 8 E.

This formation occurs in several short belts in the broken up strata at the north-east end of the Colvin Mountain. Its upper 100 to 125 feet here are of purplish shales with interstratified seams of yellowish green shales.

The "*Dark Corner*", a broken irregular cove of several square miles in area that extends back into the Jacksonville or Choccolocco Mountains to the north-east of the Blue Mountain, is underlaid, partly at least, by the shales, slates, and limestones of this formation. These strata along the foot of the mountains or along the big overthrust fault can plainly be seen to be covered by the thrust over [b] Weisner [Chilhowee] Sandstones of the mountains. To the north-west of them, however, there is an irregular narrow belt of black carbonaceous looking shales that weather into dull dark or dove or yellowish shales, that may be, so far as looks are concerned and no fossils have been found in them, either of this formation or of the [c] Montevallo [Variegated] Shales, or of the [j] Oxmoor Shales and Sandstones (Floyd). They are howeveer believed to be of the thrust over (c) Montevallo (Variegated) Shales rather than of this formation, and of this formation rather than of the (j) Oxmoor Shales and Sandstones, simply because their presence here can in this order be most easily explained. The limestones, shales, and slates of this formation in the "Dark Corner" are interstratified with each other and in places can be seen to change from one to the other. The limestones are in patches. They are fossiliferous and have been extensively quarried and burnt into lime in the N. E. ¼ of N. E. ¼ of S. 26, T. 15, R. 8 E. They here, with some interstratified shale, make a low mountain of some 5 acres in extent. This outcrop has been used some also for fluxing purposes. The shales in places along near the foot of the mountains have been metamorphosed until they resemble in appearance hidro-mica shales or the [a] Talladega (Ocoee) Slates. The slates are probably very good for roofing purposes in some of the outcrops, as at the quarries at the head of the "Dark Corner" or in the S. W. ¼ of S. E. ¼ of S. 26, T. 15, R. 8 E. These quarries or blasted holes in a bluff on the north-west bank of the creek, two in number, are about 150 yards apart, the slate outcrop being some 300 yards broad up and down the creek or north-west and south-east. This slate has a good cleavage and is hard, though it is badly twisted on the outcrop and it crumbles some on exposure. Good roofing slate, however, could doubtless be gotten from it by proper mining and picking.

(4) *Upper Silurian*, (g) *Red Mountain* (*Clinton*) *Formation*. This formation from 0 to over 500 feet thick in Calhoun county is confined to the north-west half of the county. It is highly developed in places, while in other places, where it ought to be, it is either totally wanting or is very thin. Its outcrops are along the tops and steep north-west sides of ridges and mountains with a general north-east and south-west trend. It is of two belts, of which the Green Creek and Colvin Mountains, along the north-west county line, are one, and the other includes all of the ridges carrying the formation within the county. These ridges are sometimes repeated several times by faults. They are then separated by narrow valleys of other formations. This formation is therefore in narrow bands. These bands do not make over a dozen square miles of the surface area of the county.

The Green Creek and Colvin mountains are high mountains that are much steeper on their north-west than on their south-east sides and are much higher above the country to the north-west of them than the country to the south-east. They have along their tops a massive sandstone, of near the bottom of this formation, that makes high ledges and bluffs. This sandstone forms the uppermost of the shoals in the Coosa River below Greensport.

Red Ore, as loose pieces of good ore, occurs scattered over the top of the Green Creek Mountain at Dodd or Acker Gap in the N. E. ¼ of S. 33, T. 13, R. 6 E. This ore is said to occur in three seams to the north-east. The top one of these seams, as a ledge of good ore about 7 inches thick, crops out down on the south-east side of the mountain in the S. W. ¼ of N. W. ¼ of S. 23, T. 13, R. 6 E. This ore has in it some flattened grains. An average sample of it, dried at 100 deg. C., gave the following partial analysis:

Ferric Oxide	75.933
Silica	16.680
Phosphoric Acid	0.154

Analyst:—J. L. Beeson.

Red Ore, loose over the uppermost strata of the formation down on the south-east side of the mountain, shows in considerable quantity at the Walker Gap in the western part of the S. E. ¼ of S. 12, T. 13, R. 6 E. In one place here, there is something like the following outcropping:

Outcropping at the Walker Gap in S. E. ¼ of S. 12, T. 13, R. 6 E.

(3) *Red Ore;* seemingly of poor quality, soft, very fossiliferous	3 ft.
(2) Sandstone	5 ft.
(1) *Red Ore*	½ to ¾ ft.

To the north-east about one mile, there is said to be down on the south-east side of the mountain, the outcrops of five different seams of red ore. Only one of these outcrops has been seen. It is of very poor or siliceous ore, with flint pebbles, about 14 inches thick. An average sample of it, well leached, dried at 100 deg. C., gave the following partial analysis:

Ferric Oxide	52.394
Silica	42.661
Phosphoric Acid	0.329

Analyst:—J. L. Beeson

Just over or up the mountain from the above outcrop, however, there is loose ore of another of the seams. This ore is in slabs from 6 to 8 inches thick and is of very good quality.

The Green Creek and Colvin mountains are lapped for several miles by faults, at the Davis Gap. This lap is made by the south-west end of the Colvin Mountain bending in somewhat the shape of the blade of a pruning hook around to the south-east of the north-east end of the Green Creek Mountain. To the north-east of this gap or lap, the Colvin Mountain is in the line of continuation of the Green Creek Mountain. In the lap, at the A. & C. R. R. tunnel, the strata of this formation must be something over 500 feet thick, if the tunnel, as said, is 900 feet long. The tunnel is entirely within the strata of this formation and the dip at the south-east end of it is about 30 deg. to the south-east and at thee north-west end about 50 deg. to the south-east. In th upper of these strata, within 12 to 14 feet of the top of the formation, there is a seam of very variable red ore. This seam in the approaching cut to the tunnel varies from 8 inches to 1 ft. 3 in. in thickness. It is just over or at the top of a sandstone, without any plane of stratification between the two. These upper strata are so entirely different on the two sides of the cut as to make it difficult to recognize the corresponding strata in the two banks. In them, there is a fault along which the strata to the south-east has been pushed about 15 feet over those to the north-west.

Red ore, in large quantity, lies loose over the surface of the east side of the mountain in the S. W. ¼ of S. E.¼ of S. 33, T. 12, R. 7 E. Much of it, of good quality, is in brick-like blocks, while some of it, not near so good, is in large sandy and pebbly boulders. The former has flattened grains and is very fossiliferous, and the latter appears to have come from a seam from 10 to 12 inches thick. Some, at least, of the brick-like block ore doubtless came from a seam, over that of the sandy or pebbly ore, of which the following is an outcropping:

Outcropping in S. W. ¼ of S.E. ¼ of S. 34, T. 12, S. 7 E,

(5) Debris.	
(4) *Red Ore*	6 to 8 in.
(3) Shale	1 to 2 in.
(2) *Red Ore*	3 to 4 in.
(1) Sandstone.	

An average sample of both the above block and boulder ore, dried at 100 deg. C., gave the following partial analysis:

Ferric Oxide	57.945
Silica	35.898
Phosphoric Acid	0.228

Analyst:—J. L. Beeson.

See analysis of red ore (2) at the end of this chapter for analysis of the upper or better ore, said to be 12 inches thick at the *Pryor Mine* in the N. W. ¼ of S. 19, T. 13, R. 7 E., and see analysis of Red Ore (3) at the end of the chapter for analysis of the lower or poorer ore at the *Laney Openings* in S. 2, T. 13, R. 7 E., where the ore is reported to be 3 feet 6 inches thick.

Red Ore, of good quality with flattened grains, occurs loose over the surface along the road over the mountain at the Colvin Gap in the northern part of S. 36, T. 12, R. 7 E. Its outcrops are said to be three feet thick in the N. W. ¼ of N. W. ¼ of S. 31, T. 12, R. 8 E. This ore in the eastern part of S. 35, T. 12, R. 8 E., is seemingly thin. A thin seam of it in places caps the formation or is just under the [i] Fort Payne Chert, there being here no [5] Devonian. This top stratum in a great many places is a ferruginous conglomerate, with very small rounded flint pebbles, that is sometimes ferruginous enough to be a good ore. It and other upper strata of the formation hereabouts are more or less greenish tinted. The bottom strata, for over 100 feet in thickness, are of purplish shales with interstratified seams of yellowish green shales and of black ferruginous sandstones, mostly flaggy.

The strata of Colvin Mountain or of this formation in trying to bend around the head of Qhatchee Creek were faulted off into several distinct ridges with the massive sandstones, often a quartzite or conglomerate, along their tops. The greatest of these ridges is the crescent shape *Coffee Mountain.* This mountain has an immense pile of the massive rocks at its north-east end and a high bluff, "Ivey Bluff," at its south-west end. Three of the ridges set in just to the north of this bluff and gradually rise towards the north-northeast until they butt up against each other in the high bluffy promontory-like point, "*Buzzard Roost*," in the N. E. ¼ of S. 1, T. 13, R. 8 E. The view from "Buzzard Roost" is very fine, especially towards the north-east.

To the south-west for some 7 miles, the strata of this formation are engulfed in a great overthrust fault along the south-east edge of the Ohatchee Creek Valley.

This formation in the south-east belt is in narrow bands along the tops of ridges that in places are repeated several times by faults and in other places are engulfed in these faults. Some few of these ridges in places are made up almost wholly of this formation while in other places these same ridges and other ridges have but very thin bands, if any at all, of the strata of this formation. The strata of this formation are therefore not always even continuous with the ridges.

The massive sandstones, usually white and quartzitic and oftentimes a conglomerate, of the ridges, especially along the south-east edge of the south-west end of the belt, may be partly, at least, Sub-carboniferous instead of being of this formation. The only fossils that have been seen in them are crinoidal stems.

These massive white quartzitic sandstones and conglomerates make two rows or bluffs, about 150 yards apart, along the top of the high ridge or mountain that sets in to the south-east of the *Sulphur Springs* in the western part of the county and occur on the ridges to the north-east to *Rock Pile Mountain* west of Alexandria.

The above high ridge or mountain to the south-east of the Sulphur Springs owes its prominence to the butting together of two ridges, at their south-west ends, with the massive quartzitic sandstones and conglomerates along their tops. Its two rows or bluffs of these rocks are therefore separated by a fault. They are also just to the north-west of a big overthrust fault.

The above quartzitic sandstones and conglomerates form to the north-east of Cane Creek two high mountains that, within a couple of miles to the north-east, run into each other and then together form a single broad broken mountain to the north-east for several miles or until the north-west one becomes completely engulfed in a fault to the north-west of it. This north-west mountain is known as the "*Chalybeate Spring Mountain.*" Their massive quartzitic rocks are believed to be at the top of the formation, as the limonite seemingly just over them is doubtless Sub-carboniferous.

The Chalybeate Spring Mountain is also run into from the north-west, near both its south-west and north-east ends, by ridges with sandstone ledges along their tops. These ridges are separated from each other and from the Chalybeate Spring Mountain by faults.

The "*Rock-pile Mountain,*" in the S. E. ¼ of S. 30, T. 14, R. 6 E., got its name from a pile of rocks on its top. The loose rocks for some distance around were collected together into this pile, which is now of a crater shape with a rim about 3 feet high and a diameter of some 40 feet. Most probably it was originally a conical-shape tomb that has been torn down or opened up by treasure and curio hunters.

Red ore, as a siliceous seam from 2 to 4 inches thick, crops out at the end of the ridge in the N. E. ¼ of S. E. ¼ of S. 14, T. 13, R. 7 E. See analysis (1) of red ore at the end of this chapter.

The strata along the road leading west from Old Goshen believed to be partly of this formation, are badly broken up and faulted.

(5) *Devonian,* (h) *Black Shale.* This formation is believed to occur in only a few places in Calhoun county and in these places its maximum thickness can't be over a few feet. It is known to be wanting in many places. It is of black or dark colored shales and sandstones.

(6) *Lower Sub-carboniferous,* (i) *Fort Payne Chert.*

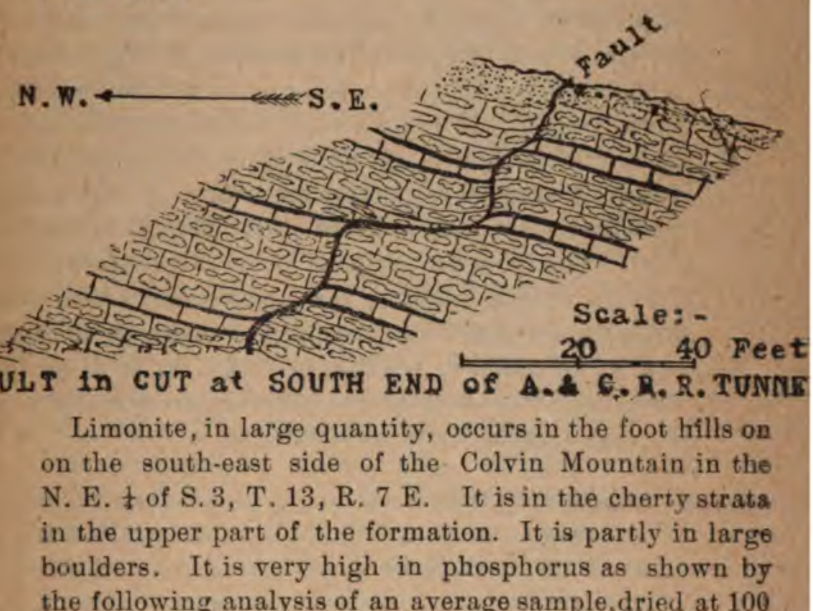
This formation, from about 25 to 150 feet thick in Calhoun county, is in narrow belts with a general north-east and south west trend that are confined to the tops and sloping south-east sides of mountains and ridges. It covers the sloping south-east sides or the Green Creek and Colvin mountains and of numerous ridges to the south-east These ridges are in places repeated several times by faults. With all these narrow belts, the formation does not cover more than 30 square miles of the surface area of the county.

This formation, in a general way, becomes thinner towards the south-east and its chert becomes supplanted by shales and sandstones to a greater or less extent.

Its chert helps to form the shoals across the Coosa River just below Greensport. Under it or at the bottom of the formation at the Walker Gap, in the northern part of S. 13, T. 13, R. 6 E., there are first ledges of a yellow ochre-colored siliceous rock, then this same yelrowish rock interstratified in a yellowish shale 5 to 6 feet thick, and then finally a red clay shale 2 to 3 feet thick to well known Red Mountain (Clinton) strata. The red shale may also be Red Moutain (Clinton). The overlying strata are doubtless all Sub-carboniferous. There is therefore no Devonian here.

Limonite occurs at intervals along the south-east foot of the monntain. See analysis of deposit 13 at the end of this chapter for these limonites west of the A. & C. R. R.

The Devonian formation is also wanting in the railroad cut leading up to the south-east mouth of the tunnel under the Colvin Mountain in the north-east corner of S. 3, T. 13, R. 7 E. The bottom strata of the Fort Payne Chert here are of ferruginous chert, with streaks of halloysite, about 18 feet thick, then thin seams of a dirty yellowish flinty chert with ferruginous streaks, some 45 feet thick, to an overlying mulatto clayey loam with seams of chert that are ferruginous in places. The chert shows its stratification perfectly well in the lower 50 feet of this loam and then imperfectly in the next 30 feet. It rapidly flattens below the surface or towards the south-east. It has here in its uppermost strata a small fault. This fault is peculiar in that it makes a broken line that runs for short distances at a time at right angle to the stratification and then with the stratification. The accompanying Fig. 13 is a rough sketch of this fault.



FAULT in CUT at SOUTH END of A.& C.R.R.TUNNE

Limonite, in large quantity, occurs in the foot hills on on the south-east side of the Colvin Mountain in the N. E. ¼ of S. 3, T. 13, R. 7 E. It is in the cherty strata in the upper part of the formation. It is partly in large boulders. It is very high in phosphorus as shown by the following analysis of an average sample, dried at 100 deg. C:

Ferric Oxide	62.287
Silica	25.360
Phosphoric Acid	3.167

Analyst;—J. L. Beeson.

This brown ore, at the same geological horizon or in the same strata, occurs at intervals along the foot of the mountain for some 8 miles towards the north-east or to the north-east end of the (Colvin) mountain. It is of course in much larger quantities in places than in others. It shows up in considerable quantity by the side of the road over the mountain at the Colvin Gap in the northern part of S. 36, T. 12, R. 7 E. It is in large deposits in the southern parts of S's 34 & 35, T. 12, R. 8 E. The deposit in the N. ½ of S. ½ of S. 35, T. 12, R. 8 E. is especially large. Its ore is partly in regularly stratified seams that stick up or project 7 to 8 feet above the surface as large boulders. About 100 yards to the south-east of an outcropping of these large boulders up on the side of the mountain, the bed of a branch is of solid limonite that shows to a width of some 60 feet across the strike. It is of a regular stratified seam with a dip of about 30 deg. to the south-east. The loose ore extends over a considerable area. The ore of this deposit is for the most part a dark colored compact ore that is almost high enough in phosphoric acid to be called a phosphate rock. It is also high in iron, as can be seen by the following analysis of a good average sample, dried at 100 deg. C. :

Ferric Oxide	64.592
Silica	12.460
Phosphoric Acid	3.680

To the north-west of the above ore deposit or about in the N. E. ¼ of S. E. ¼ of S. 35, T. 12, R. 8 E., there is at the bottom of this formation, at least in places, a deep golden yellow ochreous siliceous rock of very light weight about 4 feet thick. It has often a greenish tinge and sometimes a cherty look. It is usually in hard thick flaggy seams, though sometimes it is shaly. It can be seen in places to pass gradually into seams of chert. It lies between hard ledges of fossiliferous chert over it and a seam of red ore under it. It corresponds in geological position to the beds of clay and halloysite at the bottom of this formation in DeKalb and other counties. There is however here no Devonian strata under it.

Farther to the north-east, on the top of the extreme north-east end of the Colvin Mountain or in the S. E. ¼ of N. E. ¼ of S. 31, T. 12, R. 9 E., there is considerable limonite scattered over the outcrops of the lower strata of this formation.

The strata of this formation before they get to the extreme north-east end of the Colvin Mountain or in trying to bend around the Ohatchee Creek Valley of Upper Sub-carboniferous strata, are separated into several short distinct ridges and are badly broken up. These short ridges have a general trend that is about at right-angle to that of the Colvin Mountain. They are made up partly of underlying strata and are separated from each other by faults. Their location and extent can be best seen on the State Geological Map.

On the west side of the southern end of the most western of these ridges or in the S. W. ¼ of S. W. ¼ of S. 1, T. 13, R. 8 E., there is a row of large boulders or the outcrop of a massive stratified ledge of limonite with a north and south trend. It is in the upper part of the formation. To the west of this ledge out in the field, the loose ore, doubtless from the above ledge, has been heaped up into piles to enable the ground to be ploughed. This ore is in very large quantity, though it is for the most part impure or cherty and high in phosphoric acid.

Some of the cherty ore is fossiliferous, the chert in places being a mere mass of fossils. The following analysis is of an average sample of this ore, dried at 100 deg. C.:

Ferric Oxide	71.690
Silica	14.883
Phosphoric Acid	3.158

Analyst, J. L. Beeson.

In one, at least, of the above short ridges, the bottom strata of this formation, as can be seen in a ravine in the S. E. ¼ of S. W. ¼ of S. 1, T. 13, R. 8 E., are of a soft yellow chalky chert of very light weight. This rock is immediately on top of a ledge of ferruginous Red Mountain (Clinton) conglomerate. There is therefore no Devonian here.

The next belt of this formation to the south-east of the Green Creek Mountain covers the top and south-east side of the ridge along the south-east edge of the *Six-foot Valley*. In its strata along the top of the ridge to the north-east and south-west of the crossing of the Greensport road, at the *Janey Furnace* or in the N. W. ¼ of S. 28, T. 14, R. 6 E., there is a large deposit of limonite. This deposit has been dug into some, though its ore now shows up better over the surface than it does in the old diggings. The lowest of the ore that is visible, in the bottom of the diggings, is in light gray argillaceous shales, while the uppermost, a gravelly ore, is in red loam along the south-east foot of the ridge. The ore is in boulders, nodules, and gravels, and is mostly a compact dark colored ore that is high in both iron and phosphoric acid. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	70.048
Silica	12.146
Phosphoric Acid	1.338

Analyst;—J. L. Beeson.

Some scattering limonite occurs along the county line, on a ridge, in the S. W. ¼ of S. 34, T. 15, R. 5 E., and on the south-east side of an other ridge, in the S. W. ¼ of S. E. ¼ of S. 19, T. 15, R. 6 E., there is a plastic clay that has been derived from the weathering of argillaceous shales near the bottom of the formation. These shales, in places, are of golden, reddish, and dark colors. They appear to be about the only strata of the formation, here thin, on the high mountain that ends to the north-east in the "Rock-pile Mountain." In them on an other high mountain just to the north-west, known as the "*Chalybeate Spring Mountain*", there are several large deposits of limonite that were worked some during the civil war when the old furnace on Cane Creek, in the S. W. ¼ of N. E. ¼ of S. 14, T. 15, R. 6 E., was in blast. One of the limonite old diggings is to be found a short distance to the north-east of the site of the old furnace or in the S. W. ¼ of S. E. ¼ of S. 11, T. 15, R. 6 E., in the south-west end of a short spur of the high south-east mountain. The shales carrying the limonite of this digging, with some streaks and specks of halloysite, are argillaceous and are of golden and yellowish colors with sometimes a purplish cast. They appear to dip under the sandstone of the south-east mountain. If these sandstones are Red Mountain (Clinton), as supposed, there must be an overthrust fault between the two. It might be that the sandstones are of the (j) Oxmoor Shales and Sandstones. The limonite is of very light weight or is spongy. It is said, however, to have given the best of results in the furnace. It is very high in phosphorus, as shown by the following analysis of an average sample, dried at 100 deg. C.:

Ferric Oxide	66.660
Silica	12.950
Phosphoric Acid	3.311

Analysis:—J. L. Beeson.

Others of the limonite old diggings, that are much more extensive, are to be found farther north, near the top of the Chalybeate Spring Mountain in the N. E. ¼ of N. W. ¼ of S. 11, T 15, R. 6 E. Their ore is different. It is a concretionary or pot ore that is filled with ochre. This ochre is sometimes yellowish and clayey, and sometimes hard, white, and cherty with crinoidal stems.

Other limonite old diggings, with a great deal of loose ore over the surface around them, are to be found to the south-west, on top of the mountain about in S. E. ¼ of N. W. ¼ of S. 11, T. 15, R. 6 E. The ore of these diggings is just on top of massive Red Mountain (Clinton) sandstones and conglomerates that crop out as a bluff along the north-west crest of the mountain. This ore is for the most part cherty.

A couple of the limonite old diggings are at the Chalybeate Spring in the S. E. ¼ of N. W. ¼ of S. 1, T. 15, R. 6 E. Their ore is in the golden colored shales at the bottom of the formation. The Chalybeate Spring rises in the lower of these shales, just over the Red Mountain (Clinton) sandstones and conglomerates. The largest of these limonite diggings is also in these lowest shales, in the north-east end of a ridge that here runs into the Chaybeate Spring Mountain on its north-west side. The ore of these diggings is porous or is a honey-comb ore. Though just to the north-east of the larger of these two diggings, the ore is cherty and in large compact boulders. Limonite is said to occur along the Chalybeate Spring Mountain to the north-east and to be in a large deposit about one mile to the north-east, at the end of the mountain. It doubtless occupies the same geological position as that around the Chalybeate Spring.

The mountain just to the south-east of the Chalybeate Spring Mountain, that ends on the north-east in the Rock-pile Mountain, is the higher of the two. Its sloping south-east side is of a fertile red loam from doubtless the weathering of the ferruginous shaly strata at and near the bottom of the formation.

Limonite, as a regular stratified ledge about 3 feet thick, crops out from under fossiliferous chert in the road in the southern part of the S. E. ¼ of S. W. ¼ of S. 35, T. 14, R. 6 E. It is for the most part a poor sandy ore, though it has some streaks of good ore.

Limonite makes a small showing on the south-east side of a ridge in the S. W. ¼ of S. 15, T. 14, R. 6 E. It is said to occur along this ridge for some 2 miles to the south-west.

Ridges of fossiliferous chert point in towards Duke's Station or the crossing of the East & West and Anniston & Cincinnatti railroads, from all points except the north-west. A large deposit of limonite is said to occur in the N. E. ¼ of S. 4, T. 14, R. 7 E. See analysis of deposit 11 at the end of this chapter. There is an other reported deposit of limonite in the S. W. ¼ of S. 28, T. 13, R. 7 E. See analysis of deposit 12 at the end of this chapter.

The lower strata of this formation make along the road as it passes through the Reed Gap in the S. E. ¼ of S. E. ¼ of S. 33, T. 13, R. 7 E about the following outcropping:

Outcropping in Reed's Gap in the S. E. ¼ of S. E. ¼ of S. 33, T. 13, R, 7 E.

(9) *Chert;* loose, covering south-east side of ridge.
(8) *Chert. Clay;* chert with interstratified red clay................................12 to 14 ft.
(7) *Shales, Sandstones;* yellow and brown, sometimes weathering red, with in places some interstratified chert, about ....5 ft.
(6) *Loam, Chert;* red loam with interstratified chert.......... .... 5 to 6 ft.
(5) *Shales, Sandstones;* yellow and brown, sometimes weathering an orange color, very fossiliferous (*Fenestella, Rhombopora, Spiriferina, Lingula*, etc.)........... ......5 to 6 ft
(4) *Chert;* black ....2 in.
(3) *Sandstone;* calcareous, black, very hard though becoming a black shale on weathering ....10 in.
(2) *Shale;* golden yellow........... ....2 ft.
(1) *Red Mountain (Clinton);* pinkish shales, visible about.................................30 ft.

A soft ferruginous rock of very light weight, of a yellow ochre color with velvety spots, occurs in the upper strata of this formation in the Sulphur Spring Gap in the southern part of the N. W. ¼ of S. 2, T. 14, R. 7 E.

The *Monahan Limonite Banks* are on the south-east side of a fossiliferous chert ridge in the N. W. ¼ of S. E. ¼ of S. 3, T. 13, R. 9 E. The ore did not show up well in these banks at the time visited and that scattered over the surface was badly mixed with loose chert. It is mostly a light porous ore, though some of it is black and waxy. It is high in both iron and phosphoric acid, as can be seen from the following analysis of a good average sample, dried at 100 deg. C.:

Ferric Oxide	74.333
Silica	12. 537
Phosphoric Acid	1.786

Analyst:—J. L. Beeson.

(7) *Upper Sub-carboniferous*, (6) *Oxmoor Shales and Sandstones.*

This formation, of shales and sandstones with some few interbedded limestones, forms in the county about 125 square miles of mostly a broken sterile country that is but little in cultivation. Its strata are from 800 to 1500 feet thick. It was of one solid body until along near its south-east boundary it was bably crumpled, folded, and faulted, and afterwards washed out until it was cut or divided up, by the exposure of underlying formations, into numerous belts with a general north-east and south-west trend. The general dip is steep and to the south-east, though in places, from the wrinkles and folds in the strata, it is to the north-west. The naked outcrops are many.

The shales are much the most important or abundant of its strata. They usually make a nobby country, though sometimes a flatwood country that is poorly drained. They are the softer materials and hence they are the worst crumpled and broken up. They often show slicken sides with an unctuous feeling. They are however most commonly hard, black, and arenaceous, and on the weathered surfaces ore often of brown, gray, reddish, yellowish, and dove colors. They are in places so black and bituminous as to have been dug into for stone coal. They have black carbonaceous splotches between their laminae and look very much like the shales of the Coal Measures. They are in places so bituminous that the crude oil exudes from them, forming a scum on the waters of wells, etc. They are frequently calcareous and oftentimes carry streaks and specks of calcareous matter. They are in a few places calcareous enough to give rise to a fertile red loam. They also have more or less pyrite, usually in balls. The weathering of this pyrite doubtless gives rise to its chalybeate and sulphur waters.

The sandstones are most commonly flaggy, though they are often massive. The most massive ones are near the bottom of the formation and doubtless correspond to the Hartselle Sandstones of the Tennessee Valley. These sandstones are commonly hard white cherty or flinty looking rocks with quartz crystals over their surfaces and lining their cavities. Some of them are calcareous with the calcareous streaks, etc., on the surfaces weathered out into cavities. Some of them are fossiliferous. They may include some of the massive white quartzitic sandstones and conglomerates of the higher ridges and some of the dark colored calcareous flaggy sandstones of the lower ridges and knolls that have been described and maped as [g] Red Mountain [Clinton].

The limestones show in comparatively few places. They occur as interstratified layers of boulders and nodules and as thin sheets in the shales. The same boulder is sometimes partly a quite pure limestone and partly a quite pure sandstone, with a distinct line or plane of division between the two. The limestone nodules are often seen sticking to the sandstone boulders like those of chert to limestone. The interstratified limestone sheets come and go. They usually occur in the strata along with the nodules. The limestones, as a whole, are gray, though some of them are almost black. They are sometimes shaly and even fissile. They are usually impure or sandy, and often have over their weathered surfaces dirty, grayish, raspy, sandy splotches. They sometimes have weathered surfaces or shells of a yellowish looking sandstone from which the limy matter has been leached out. They are also usually full of calcite streaks and splotches and are often very fossiliferous. Some of them however have been marbleized or metamorphosed until the fossils are obliterated or appear as mere white specks of calcite. These partly metamorphosed rocks are hard enough to take a very good polish and hence, when pure enough and free of flaws, answer very well for marbles.

This formation on the high points in the south-west corner of county, for a mile or so out from the river, is coverd with rounded or water worn flint pebbles and ferruginous conglomerates of Tertiary (Lafayette) Age.

The waters of the *Sulphur Springs*, in outcrops of blackish shales with interstratified seams of resinous looking brown and grayish sandstones, in the N. W. ¼ of S. W. ¼ of S. 30, T. 15, R. 6 E., are very plesant to the taste, being but slightly impregnated with sulphuretted hydrogen.

The massive white quartzitic sandstone of the mountain just to the east of the above Sulphur Springs and of the mountain to the north-east that ends in the Rock-pile Mountain may posibly be of this formation. They are slightly fossiliferous [*crinoidal stems*].

The black carbonaceous shale has been dug into for stone coal on Tallaseehatchee Creek in the S. W. ¼ of S. 19, T. 14, R. 6 E., and S. E. ¼ of S. 16, T. 14, R. 7 E.

Between one and two miles north of Alexandria, there is an isolated patch of badly contorted black bituminous calcareous shales with sandstone lenses and calcite specks. The sandstone lenses have white calcite streaks and shining quartz crystals. This patch is surrounded entirely by Cambrian strata, [c] Montevallo [Variegated] Shales [Rome] and [e] Red Lands or Upper Connesauga. On the east, however, there is between it and a great body of similar strata of this formation merely a low narrow ridge or divide of the [c] Montevallo [Variegated] Shales. This patch is believed to be of the [j] Oxmoor Shale and Sandstone formation and to be connected below the surface or under the low narrow divide with the great body of this formation to the east. If this is so, the low narrow divide of [c] Montevallo [Variegated] Shales [Rome] would be of strata that had been pushed or thrust over on top of this formation. Such is really believed to be the case.

Chert, in thick stratified ledges, in this formation is to be seen at the mill in the S. W. ¼ of S. 9, T. 14, R. 8 E., and a short distance eastward, just across Tallaseehatchee Creek, there is by the side of the road one of the boulders of half limestone and half sandstone.

The white striped limestones or partly crystalline limestones with white calcite streaks in an outcropping along the fault or foot of the ridge of [c] Montevallo [Variegated] Shales [Rome] in the S. W. ¼ of S. 10, T. 14, R. 8 E., are known as marbles. They doubtless take a very good polish.

The very black carbonaceous shales taken from a well in the S. E. ¼ of N. E. ¼ of S. 31, T. 12, R. 10 E., were supposed by some to be an indication of stone coal.

[8] *Carboniferous*, [k] *Coal Measures.*—The Coal Meas- of this county are believed to be less than 1500 feet thick. They are of the extreme north-east end of the Coosa Coal Field, which does not extend eastward into this county or across the Coosa River much over a mile.

This formation does not therefore make more than 800 or 900 acres of the surface area of the county. It is confined principally to S. 19, T. 14, R. 6 E.,though it takes in small portions of S's 18 & 30, T. 14, R. 6 E. and S. 24, T. 14, R. 5 E. Its boundary is the the high, steep, broken mountain that is locally known as the "*Sand Mountain*". This mountain, in a general way, is of a U shape with the bottom pointing eastward. It is almost wholy of the hard massive conglomerates near the bottom of the formation, and is the elevated rim around the north-east end of an unsymmetrical synclinal trough with a much steeper north-west than south-east dip. The formation is therefore made up of this mountain and the area within it or between it and the river. It doubtless carries some stone coal within this county, though none has been seen in it. The conglomerates are very good fire proof materials and hence would suit very well for building chimneys, coke ovens, etc. They in places weather into a beautiful pure white sand that would doubtless answer very well for glass making, mortar, etc.

ABSTRACT OF REPORT BY MAJ. G. D. FITZHUGH, C. & E., [illegible] & N. R. R. CO., ON THE REGION ALONG THE ANNISTON AND ATLANTIC RAILROAD IN CALHOUN COUNTY.

Limonites (Brown Ores.)

Localities and Names of Analyzed Deposits

Deposits.	Section.	Township.	Range.	Name.
(1)	S's 16 & 9.	16 S.	7 E.	Buchanan etc.
(2)	NW. 1-4 of S. 7	16 S	8 E.	Washer Banks.
(3)	SE. 1-4 of S. 29	15 S.	8 E.	Hockins' Mines.
(4)	S. 21	"	"	Shelton Mines.
(5)	E. 1-2 of S. 19 and SW. 1-4 of S. 20	15 S.	8 E.	C. A. Sprague's.
(6)	S. 35	15 S.	7 E.	Edmundson Ore Beds
(7)	S. 25	"	"	Leatherwood Mine.
(8)	S. 24	"	"	Cooper Ore Bed.
(9)	NE. 1-4 of S. 8	"	"	Clark & Clements.
(10)	S. 32 and S. 35	14 S. 14 S;	7 E. 6 E.	Gladden, Langford, et
(11)	NE. 1-4 of S. 11	14 S.	7 E.	J. D. Ursery.
(12)	SW. 1-4 of S. 28	13 S.	7 E.	C. N. Jilkes.
(13)	South side of Colvin Mt. west of A. & C. R. R.			
(14)	NE. 1-4 of S. 2	13 S.	7 E.	Laney & Piedmont Mine.

Analyses.

Deposits.	Silica	Met Iron.	Manganese	Alumina	Lime	Sulphur	Phosphorus	Water at 212° F.	Analyst
1	3.05	57.40	Trace	3.68	0.35	Trace	0.05	1.05	W. B. Phillips.
2	16.40	41.58	0.33	9.04	Trace	Trace	0.05	0.70	" " "
3	21.75	47.97	0.57	0.46		Trace	0.11	0.45	" " "
4	6.80	55.41	Trace	1.32	0.40	Trace	0.11	0.55	" " "
5	9.90	50.11	0.36	8.00	0.40	Trace	0.05	1.00	" " "
6	9.00	52.92	Trace	0.21	0.50	Trace	0.05	0.50	" " "
7	6.55	51.93	0.72	3.85	0.60	Trace	0.05	0.45	" " "
8	31.95	41.32	0.20	2.84	Trace	Trace	0.05	0.40	" " "
9	1.65	58.71	Trace	2.01	0.30	Trace	0.12	0.55	" " "
10	3.57	53.42	Trace	4.00	0.20	Trace	0.05	1.10	" " "
11	2.67	51.18	Trace	9.12	0.50	Trace	1.64	0.80	" " "
12	5.10	55.18	0.50	3.58	0.30	Trace	0.33	0.89	" " "
13	9.80	48.73	Trace	5.02	0.25	Trace	1.11	1.20	" " "
14	9.70	49.11	Trace	5.01	0.40	Trace	1.58	2.00	" " "

Red Ores (*Hematites.*)

	(1)	(2)	(3)
Silica	58.45	13.85	34.55
Metallic Iron	9.82	51.66	32.76
Manganese	0.28	trace	0.20
Alumina	14.88	7.12	9.14
Lime	0.60	0.70	0.30
Sulphur	trace	trace	trace
Phosphorus	0.19	0.28	0.36
Water at 212 deg. F	0.50	0.60	1.75

Analyst:—W. B. Phillips.

[1] Half-mile north of Duke's Station, seam 8 inches thick.

[2] Pryor Mine on upper seam 12 inches thick, Colvin Mountain, in the N. W. 1-4 of S. 19, T. 13 S. R. 7 E.

[3] Laney and Piedmont Mine on the lower seam 3 feet 6 inches thick, Colvin Mountain, in the S. 2, T. 13, R 7 E.

CHAPTER XIV.

CHEROKEE COUNTY.

This county embraces about 660 square miles. Its area was originally made up of great folds with a general north-east and south-west trend but these folds have in a great measure been obliterated or obscured by upheavals, faults, and denudation. Parts of some of them, however, can still be seen in the northern part of the county. Now, the synclinal troughs of these parts are mountains and their anticlinal crests are washed out or denuded valleys. Lookout and Dirt Seller mountains are of two of these troughs and Taylor's Ridge or Scraper's Mountain is the sunken north-west part of an other that was split by a fault and its south-east part washed away. These mountains are all stopped or cut off on the south-west by the Rome and Cahaba great thrust fault in its transverse curves. Their strata at their south-west ends are thus thrown in contact, along this great fault, with the large bodies of (c) Coosa [Flatwood] Shales to the south-west. Their folds may be continuous to the south-west through or into the flatwoods, but, if so, the strata of the latter are so badly crumpled and faulted as to hide them. The south-east portion of the county is especially complicated by folds and faults.

The geological formations of the county are as follows:

[7] *Carboniferous*	[j] *Coal Measures*	400 feet
[6] *Upper Sub-carboniferous*[i]	(1) *Bangor Limestones and Hartselle Sandstones* (2) *Oxmoor Shales and Sandstones*	Contp. 1000-1800 ft
[5] *Lower Sub-carboniferous*	[h] *Fort Payne Chert*	25-250 feet
[4] *Devonian*	[g] *Black Shale*	0-50 feet
[3] *Upper Silurian*	[f] *Red Mountain (Clinton)*	0-600 feet
[2] *Lower Silurian*	[e] *Pelham [Trenton and Chazy)*	1000-1800 feet
	[d] *Siliceous [Knox] Dolomite and Chert (including Red Land (Easta-boga) Limestones or Upper Connesauga)*	3000-4000 feet
[1] *Cambrian*	[c] *Coosa [Flatwood] Shales [Contemporaneous with Connesauga.]*	1200-1800 feet
	[b] *Montevallo [Variegated] Shales [Rome and Lower Connesauga] and Aldrich [Beaver] Limestones.*	1200-2000 feet
	[a] *Weisner [Chilhowee] Sandstones*	2500+ feet

[1] *Cambrian.* This group, with a maximun exposure over 6000 feet, thick makes about ⅓ of the surface area of the county. It is made up of the following formations: [c] *Coosa [Flatwood] Shales [Contemporaneous with Connesauga]*, [b] *Montevallo [Variegated] Shales [Rome and Lower Connesauga] and Aldrich [Beaver] Limestones*, and [a] *Weisner [Chilhowee] Sandstones*.

[a] *Weisner [Chilhowee] Sandstones.* This formation is confined to the south east part of the county, to the south-east of the great body of flatwoods along the Coosa River. It covers less than 30 square miles of the surface area of the county, though its maximum exposure in the county is over 2500 feet thick. It makes the Weisner, Pine, and Indian mountains, and the

mountains within the county to the south of the East Tennessee, Virginia, and Georgia Railroad.

The *Weisner Mountain* is a prominent isolated mountain in the south-east part of the county from which this formation took its name. It suddenly rises up from the south-east edge of the great body of flatwoods to a height of from 1000 to 1400 feet above these flatwoods. It is a great local bulge in the strata or a great local exposure of the strata of this formation along just to the south-east of a great thrust fault, the *Coosa Thrust Fault*, which separates its strata from those of the flatwoods. It has some faults also just to the south-east of it, but they are much smaller. It is only about 4 miles in length and of about 3 square miles in area. It is of somewhat the shape of an open horse shoe with its toe towards the north-west and its slanting side towards the inside of the shoe. The top of this mountain has a very great exposure of light colored and yellowish sandstones and conglomerates that are very hard and quartzitic. These rocks, loose, fallen from the overhanging bluff along the top of the mountain, form an immense pile of several acres in extent on the steep west side of the south-west heel of the mountain. Under them or forming the steep side of the mountain, there is a grayish sandy shale that is tinged greenish, and over them or along near the foot of the sloping south-east side of the mountain, along a fault or faults, there are outcrops of yellowish, ferruginous, ochreous quartzitic sandstones and breccia that are sometimes porous and friable and sometimes very hard and compact. The pores are often filled with yellow ochre, and the partitions between the pores are sometimes ferruginous and sometimes manganiferous. These rocks are sometimes ferruginous enough to be reckoned as poor or siliceous iron ores. Their weathered surfaces are often covered with beautiful orange and rust colored spots.

The *Pine Mountain*, to the south of the south-west end of the Weisner Mountain between 2 and 3 miles, is similarly situated to that mountain with respect to the flatwoods and the Coosa Thrust Fault. It is also of similar shape and of similar rocks, though it is not near so high and large as that mountain. The sandstones and conglomerates along its top are hard, white, massive rocks that show to a thickness of 125 feet or more. The sandstones are quartzitic and some of them have a delicate pinkish tinge. The conglomerates are in places a mass of well rounded tranlucent flint pebbles that are sometimes of about the size of an English pea and are sometimes much smaller. This mountain has also near its south-west end an immense pile of the loose sandstones and conglomerates, fallen from above. It also has the yellowish ochreous ferruginous quartzitic sandstones and breccia near the foot of its sloping side along a fault or faults.

The *Indian Mountains*, as herein described, are the several high mountains with their spurs to the north of the East Tennessee, Virginia and Georgia Railroad in the south-east corner of the county. They are in the line of extension to the north-east of the *Ladiga* or *Terrapin Mountains*. They too are just to the south-east of a great thrust fault and have lesser faults between and to the south-east of them. They, like the Weisner and Pine mountains, are bulges or great local exposures in faulted unsymmetrical anticlinals with a general north-east and south-west trend. Their strata have been displaced along the faults to a greater extent than those of their anticlinal farther north-east and south-west, as the strata at the ends of several of the mountains can be seen to be in unbroken unsymmetrical anticlinals that gradually disappear or dip below the surface.

These mountains are of interstratified quartzites, conglomerates,and shales, with in the upper strata in places large quantities of limonite. The north-west mountains in a general way, appear to carry lower strata than those to the south-east. The strata of all of them are in waves and in places are badly crumpled. It is a strange sight to see these hard inflexible massive quartzites and conglomerates in sharp unbroken bends. These strata are all more or less metamorphosed, much more so than those of the Weisner and Pine mountains.

The quartzites, mostly of a light gray color, though sometimes bluish and sometimes greenish, are very hard and compact. They are usually massive, though sometimes flaggy. The hard blue rocks often show, on fresh surfaces, translucent specks that on weathering are believed to become opaque pebbles. Some of these quartzites are a mere mass of small concretionary geodes that are stained reddish and greenish and are more or less ferruginous. These geodes are lined with small quartz crystals. They appear on the weathered surfaces of the rocks as dark brown spots or indentations. The quartzites near the top of the formation are often ferruginous. They sometimes pass into a ferruginous breccia or rocky limonite and then in places into a very good limonite.

The conglomerates carry flattened rounded feldspathic looking flint pebbles from the size of a mustard seed to that of an English pea. They are in places a mere mass of these pebbles, resembling a roe, and in other places have the pebbles only in irregular streaks and patches.

The shales appear to be more abundant here than they are farther to the south-west in this formation. They are of whitish, reddish, yellowish, golden, grayish, bluish, pinkish, and purplish colors. They are more crumpled or squeezed up into sharp waves and wrinkles than are the other harder strata. They are entirely squeezed out in places on the outcrop. They are more or less talcous and are often fissile, and are for the most part arenaceous.

The limonite appears to be confined to the upper strata of the formation. It is therefore found for the most part on the south-east sides of the southeast mountains and spurs. It is principally a black waxy ore that is rocky or siliceous, though it is often high in iron. It is also usually high in phosphorus. It is regularly stratified in places, while in other places it is in pockets. The pocket ore is doubtless from the breaking down and weathering of the stratified ore. It is usually purer than the stratified ore from the fact that in its breaking up and weathering the sand or siliceous matter was to a certain extent separated from the ore. The rocky or very sandy ore is usually either stratified or in large boulders. It is often nothing more than ferruginous quartzites and breccia with pockets of better ore. The breccia, with many of the limonite banks, are along faults. The breccia itself is commonly in large rough yellowish ochreous ferruginous boulders that are more or less stratified, though badly broken up. The boulders are often covered with yellowish ochreous and rust colored spots. Plate XXXIV is of the outcrop of a stratified ledge or seam of the rocky limonite.

The *High-bluff Limonite Bank*, in the W. ½ of S. E. ¼ of S. 1, T. 12, R. 11 E., is a stratified bluff of siliceous or sandy ore that, on the dip, is some 75 feet high or is exposed to this height on the south-east side. Its ore is massive and, though most of it is rough or mixed with sandstones, there is an immense amount of it, that can be readily picked out with the hammer, which is high in iron. The bottom of the bluff appears to be of better ore than its top. This bluff of ore is just to the southeast of or is just on top of a massive conglomerate. An average sample of this ore, dried at 100 deg. C., gave the following partial analysis:

Ferric Oxide	61.860
Silica	19.395
Phosphoric Acid	1.856

Analysis:-J. L Beeson.

The *Clay Limonite Bank*, in the N. E. ¼ of S. E. ¼ of S. 2, T. 12, R. 11 E., does not show much ore, though doubtless a great deal of ore has been taken from it. It has an immense white *clay-horse*, from which several car loads of clay have been taken and shipped to Chattanooga to make into fire-bricks and for perhaps other purposes. The ore is principally a compact liver colored ore, though some of it is a black waxy ore and some of it is of light weight and cellular. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	79.805
Silica	11.481
Phosphoric Acid	0.921

Analyst:—J. L. Beeson.

The *Hickory-tree Limonite Bank*, in the S. W. ¼ of S. W. ¼ of S. 1, T. 12, R. 11 E., does not show much good ore. It has just under the ore a white *clay-horse* and just over the ore a flaggy quartzite. Its ore is high in phosphorus. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	78.078
Silica	10.060
Phosphoric Acid	1.855

Analyst, J. L. Beeson.

The above three limonite banks are high up on the sides of the mountains. They are all doubtless in ore from the same stratified seam, near the top of the formation, that is in places duplicated or repeated by folds and faults. Their ore seam can be seen as it crosses the road over the mountain between Bluffton and Rock Run. In this road it shows twice or is duplicated by a fold and fault. The south-east of these two outcrops is on the south-east side of the top of a comparatively small unsymmetrical anticlinal that is on the south-east side of one of the large or main anticlinals of the mountains. This smaller anticlinal seems to be faulted along its steep north-west side. To the north-west of it is a narrow unsymmetrical synclinal trough and on the north-west side of this trough, or down on the south-east side of one of the main anticlinals of the mountains, is the other limonite outcropping. This latter outcropping is stained with manganese.

The above stratified limonite seam, near the top of this formation, doubtless gives rise to most, if not all, of the numerous limonite banks to the south-east in the mountain spurs and knolls just to the north of the East Tennessee, Virginia and Georgia Railroad. To do this, it would have to be repeated, as it is, by folds and faults. There is however in places two of these ore seams close together. The ore of most of these banks is poor and rocky, though in some of them it is of very good quality, as that in the *Tram* or *Gravelly Limonite Bank*, on a low knoll in the S. E. ¼ of N. W. ¼ of S. 11, T. 12,

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R. 11 E. The ore of this bank is mostly compact and liver colored, though some of it is black and waxy and some little of it is cellular. It is very high in phosphorus. An average sample of it, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	75.339
Silica	11.229
Phosphoric Acid	2.497

Analyist:—J. L. Beeson.

Just to the south-west of this bank, there is a large deposit of the poor or rocky ore, yellowish ferruginous breccia and quartzites with some pockets of black waxy ore that is high in iron. This deposit, in massive boulders, forms a low short ridge along the railroad. The accompanying Plate XXXIV is of a photograph of the ore outcrop at the north-east end of this ridge.

Down the railroad, westward, around and west of the Langdon (Stonewall) Furnace, there can be seen many other ore deposits. The rocky ores or ferruginous quartzites and breccia often form back-bones to the smaller ridges and spurs while the better ores, the weathered ores, for the most part in pockets of gravels, nodules and small boulders, are to be found principally on the sides of the ridges and spurs and in the low knolls. A little farther up the railroad, eastward, the quartzites and conglomerates at the north-east end of one of the ridges to the south of the railroad can be seen to be in an unsymmetrical anticlinal that rapidly dies out or dips under the surface towards the north-east. Still farther up the railroad, eastward, in a cut, in another faulted unsymmetrical anticlinal, the inflexible quartzites and conglomerates are in wrinkles and can be seen to make the sharp bends without being broken.

The accompanying Fig. 14 is a rough sketch of t north side of this cut. It shows how the softer str are squeezed out.

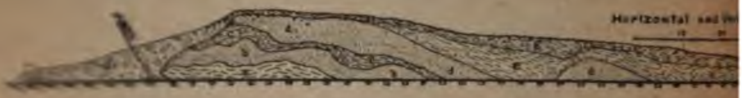

Fig. 14—Sketch of north side of railroad cut at Bluffton. (g bris, (f) Limestone (Aldrich or Beaver), (e) Golden sandy sh (d) Quartzites, (c) Hard bluish etc Shales, (b) Quartzite, (a) den sandy shales. (a), (b), (c), (d), and (e) are of the We formation.

The mountains within the county to the south of East Tennessee, Virginia, and Georgia Railroad, north-east end of the Ladiga or Terrapin Mountains, similar in every way to those of the Indian Mount They, in a general way, are of three broken moun chains, with high peaks and low gaps and many s and with a general north-east and south-west trend, are separated from each other by faults and deep row broken valleys, ravines, etc. These mountains their existence to the hard weather resisting quart and conglomerates, while the intervening valleys are to the softer nature of the shaly strata. The mount with their spurs and knolls, carry many limonite posits. The ore of these deposits is principally rock sandy, though much of it is high in iron and also p phorus. It is of two or more stratified seams that in places been duplicated by faults.

The *Wirt Hill*, in the S. E. ¼ of S. W. ¼ of S T. 12, R. 11 E., appears to have an almost solid to limonite. Its ore in one old digging is expos'd thickness of 25 to 30 feet. It is mostly a velvety ing ore with liver colored streaks and spots, tho some of it is black and waxy. It is high in iron, si and phosphorus. In another old digging on this hill, the ore, very massive and of uniform composition, shows to a thickness of 20 to 25 feet, though, in about 15 feet to the north-east of this digging, the ore does not appear to be over 12 feet thick. It is over white clay and ferruginous shales, and under white and pink shales.

On the *Pryor Childress Hill*, in the S. E. ¼ of N. W. ¼ of S. 27, T. 12, R. 11 E., there ore several old diggings on rough boulder limonite, that appears to have come from a seam about 20 feet thick. Some of this ore is liver colored and some of it is slaty. It occurs along with white *clay-horses*.

Mrs. M. C. Laney's Limonite Bank, in the S. E. ¼ of N. E. ¼ of S.28, T. 12, R. 11 E.,is in a fine exposure of velvety and liver colored boulder ore that is mostly high in iron, though some of it is sandy.

Pyrolusite, in large rough boulders and seemingly in large quantity, crops out on the top of a spur in the S. E. ¼ of N. W. ¼ of S. 28, T. 12, R. 11 E. It is spongy and is sandy with spots of white chalky looking siliceous matter of badly weathered quartzite, though some little of it is very good ore. It appears to be just under the limonite stratum and to be more or less stratified itself. It may be the lower part of the limonite stratum.

The *G. C. Laney Limonite Bank* is about ¼ mile to the south-west, though in the same *forty*. It is large boulder ore of a seam from 6 to 8 feet thick. Its ore is mostly rocky, though some of it, of a velvety liver color, is of good quality. Some of it is manganiferous and some of it is so friable that it breaks up into small angular pieces on being struck with the hammer. This bank is near the south-east foot of a spur or mountain that is said to be full of limonite which must be of underlying strata.

This same spur or mountain appears to be full of spongy limonite on its south-east side to the south-west near the county line or in the N. E. ¼ of 32, T. 12, R. 11 E. The topmost ore or that lowest down the mountain is just on top of a massive quartzite and is of a seam that is at least several feet thick. It in places is mixed with the quartzite. That higher up the mountain gives most of the surface rocks and appears to be of a seam, some 20 feet thick, that is badly mixed with quartzite. It is a liver color ore with cavities lined with botryoidal ore. This upper seam of ore is said to have in it to the south-west a great deal of manganese.

Bauxite, the red variety, is said to occur at a *pyrolusite bank* on top of the mountain in the N.W. ¼ of N. E.¼ of S. 32, T. 12, R. 11 E.

The massive quartzites hereabouts are in places weathered into loose heaps of beautiful white sand.

Limonite occurs in large quantity in large boulders on top of an other mountain to the south-east or in the N. E. ¼ of S. W. ¼ and N. W. ¼ of S. E. ¼ of S. 27, T. 12, R. 14 E. Some of it however is rocky or is nothing more than a ferruginous quartzite and some of it is a mixture, in the same boulders, of good ore and quartzite. It is of a stratified seam just on top of a massive conglomerate.

To the east of the mountainous country of this formation or to the east of the Tecumseh Furnaces, there is, along the State line from the East Tennessee, Virginia, and Georgia Railroad to the East and West Railroad, a broken piney woods country with ridges of (d) Siliceous (Knox) Dolomite and Chert, and, along its edges, loose rocks of the Weisner formation and many limonite banks along faults. The ore of some of these banks is almost wholly in boulders and in some of them it is most probably the upper strata of this formation, though it will all be considered under (d) Siliceous (Knox) Dolomite and Chert, or as belonging at the bottom of (2) Lower Silurian.

(b) *Montevallo (Variegated) Shales (Rome and Lower Connesauga) and Aldrich (Beaver) Limestones.* This formation is from 1200 to 2000 feet thick though it does not cover 5 square mile of the surface area of the county. It is of a narrow belt along the south-east edge of the flatwoods or just to the south-east of the *Coosa Thrust Fault* from the county line just east of Allsop P. O., around just to the south-east of the Pine and Weisner mountains, to the State line north-west of Dyke's Store, Ga.; and of the north-east end of a low narrow ridge that crosses the county line just north-west of Ladiga and extends to the north-east to within about ½ mile of Old Spring Garden. This ridge is also just to the south-east of a fault.

This formation, partly metamorphosed, may comprise some of the variegated talcous shales along the south-east foot of the mountains, spurs, etc., and in the narrow valleys, coves, etc., in the south-east corner of the county.

The belt from near Allsop P. O. to near Dyke's Store has several gaps in it, that were made by its strata being engulfed in faults. These gaps were made by the *Coosa Thrust Fault*, with the exception of the short ones to the south-east of the Pine and Weisner mountains that are due to smaller branch faults. *The Coosa Thrust Fault* can be seen most plainly as it cuts out the strata of this formation entirely at Mt. Zion Church in the S. E. ¼ of S. 27, T. 11, R. 10 E., and partly at Lumpkin's Mill in the S. E. ¼ of S. 11, T. 11, R. 11 E.

This formation is ridge making, though it is made up principally of shales. Its shales are of purplish, chocolate, yellowish or golden, reddish, and dove colors. They crop out in places in hard massive ledges. They have several fossiliferous (*Oleneleus,etc.*) zones. The interstratified sandstones are also variegated and are often shaly. They are usually soft enough when first quarried to be easily cut and sawed, and so they are often used for building purposes, especially for the building of chimneys.

The *Aldrich* (*Beaver*) *Limestones* have been seen in this county in only two places, one on the side of the Weisner Mountain and the other on Hurricane Creek and the railroad at Bluffton, though they doubtless give rise to some, at least, of the deep red loams on the south-east sides of the mountains, spurs, etc.,in the south-east corner of the county, and around the south-west end of the broken piney woods country to the east of the Tecumseh Furnaces.

(c) *Coosa* (*Flatwood*) *Shales* (*Contemporanaous with Connesauga.*) This formation of shales and limestones, from 1200 to 1800 feet thick forms, a great body of flatwoods with an average width of over 12 miles that extends along the Coosa River through the county from north-east to south-west. These flatwoods are principally to the south-east of the Coosa River, being bounded on the north-west by the *Rome* and *Cahaba Thrust Fault* and on the south-east by the *Coosa Thrust Fault*. They thus comprise about $\frac{1}{8}$ of the Cambrain area or over 275 square miles of the entire surface area of the county. The plane like area of these flatwoods is relieved by knolls of sandy loam and rounded gravels that lie unconformably to the underlying shales and limestones. This superficial loam with the gravels cover a great deal of the flatwoods, thus hiding and making it much more difficult to work out their structure, which must be very complicated.

Their strata are often so badly contorted and crumpled up as to make it a difficult matter todistinguish the correct dip and strike. They, however, in a general way, appear to be in flat, faulted, interlocked, unsymmetrical anticlinals and synclinals with north-east and south-west trends. These anticlinals and synclinals are more or less obscured by wrinkles and minor thrust faults that convert them into monoclinals with a general south-east dip. The lesser of these minor faults are very numerous. They are not very long but they frequently overlap each other. The major faults of these flatwoods shown in the structure sections across this county, Plate XXXV at the end of this report, are partly after Mr. C. W. Hayes, U. S. Geological Survey.

The shales are mostly of greenish and dark gray or black colors. The former, usually sandy or siliceous, have flat concretions that are in places of fine grain siliceous or cherty looking matter and in other places of calcareous matter or siliceous limestone. The siliceous concretions give rise to loose rounded pebbles and nodules over the surface that are often fossiliferous. These fossiliferous pebbles and nodules, "*pictured cobbles*," carry some well preserved fossils that have been recognized by the paleontologist, Prof. Walcott, Director U. S, Geological Survey, as casts of *jelly-fishes*. It is said that these fossil jelly-fishes are of three different forms and that Prof. Walcott has collected upward of of 8000 specimens of them. They were collected or picked up for Prof. Walcott principally by the members of a negro family near their home a few miles east of Centre. These negroes knew and collected them as "*fossil* *stars.*" The dark colored shales, of yellow and orange colors on the weathered surfaces, are clayey shales. They carry the limestones as interbedded strata that are usually thin or flaggy, though sometimes very massive. The limestones are full of calcite streaks and are commonly argillaceous, though the massive ones are often quite pure. These massive strata are usually of a blue color and are sometimes oolitic. They in places have running across their stratification streaks from 2 to 3 inches broad that appear to have once been cracks but are now calcite. The limestone outcrops, sticking up in parallel ledges, are very disagreeable to cross in wagons. They often form naked cedar glades.

These flatwoods once had over much of their area, over the superficial covering of sandy and pebbly loams, a growth of long leaf pine that has now for the most part been cut down. Their other growth, over the naked Coosa Shales, consists of comparatively small oaks, hickories, etc. Their soils are of a light siliceous gravelly soil, from the overlying unconformable sandy loams and gravels, and a straw or mullatto calcareous loam, from the underlying shales and limestones. The former makes, along the river, a great deal of level fertile land and the latter is a cold wet loam that is very hard when dry and very soft and sticky when wet.

(2) *Lower Silurian.* This formation, from 3000 to 5000 feet thick, makes about 200 square miles of the surface area of Cherokee County. It may be said to be of four irregular broken belts. The most north-west of of these belts is just to the south-east of Lookout Mountain, or more properly speaking it is just to the south-east of the Shinbone Ridge and Little Mountain; the next one is between the Dirt Seller Mountain and Gaylor Ridge; the next one is just to the north-west of

the Indian Mountains or just to the south-east of the broad expanse of flatwoods along the Coosa River; and the fourth and last one is the north-east end of the belt just to the north-west of the Terrapin or Ladiga Mountains. Their strata are of the (e) *Pelham Limestones* (*Trenton and Chazy*), the equivalant of the Rockmart Slate and Chickamauga Limestones, and [d] *Siliceous* [*Knox*] *Dolomite and Chert* [including Red Land [Easta-boga] Limestones or upper Connesauga].

[d] *Siliceous* [*Knox*] *Dolomite and Chert* [*including Red Land* [*Easta-boga*] *Limestones or Upper Connesauga*]. This formation, from 3000 to 4000 feet thick, covers nearly 4-5 or over 150 square miles of the Lower Silurian territory in Cherokee county. Its area and places can be best seen from an inspection of the State Geological Map.

The north-west belt, the one just to the south-east of the Shinbone Ridge and Little Mountain, is of a broken faulted unsymmetrical anticlinal that extends through the county from north-east to south-west. To the north-east of Round Mountain, it is complete over the top of the anticlinal, but, to the south-west of this mountain, it is for the most part, and in a couple of places near the county line is almost completely, engulfed in the *Rome and Cahaba Thrust Fault* that encroaches upon it from the south-east. To the north-east of Round Mountain, it is, in a general way, most broken along its north-west and south-east edges, where the ridges or mountains of its uppermost or cherty strata are highest. It is for the most part of a light barreny looking loam with cherty gravels and nodules. It has the characteristic lime sinks of the formation. Some of these sinks, as the "Blue Pond" in the S. W. ¼ of S. 20, T. 9, R. 9 E., hold water like a jug. This sink received its name from the color of its water, due to great depth. This belt has a cherty manganese deposit near its north-west edge, on top of the ridge in the S. W. ¼ of S. 25, T. 8, R. 9 E. There is also some reported bauxite here or near here.

The belt of this formation between the Dirt Seller Mountains and Gaylor Ridge is also of a faulted unsymmetrical anticlinal that is cut off on the south-west, to the south-east of Gaylesville, by the Rome and Cahaba Thrust Fault in one of its transverse curves. It, in a general way, is of two bands of cherty ridges that are separated by a narrow valley, along Chattooga River, of Red Land (Easta-boga) Limestones or Upper Connesauga. The north-west band of cherty ridges is completely engulfed in a strike fault for about a mile or two about opposite Gaylesville to the south-west to the Rome and Cahaba Thrust Fault. For this distance the Easta-boga Limestones are in contact on the north-west with (?) Red Mountain (Clinton) strata. The south-east band of cherty ridges extend around the south-west end of the Gaylor Ridge to the Rome and Cahaba Thrust Fault and then, as a narrow strip, between this fault and another one along the foot of the monoclinal ridge, to the north-east to about the State line. Its strata are in contact along the Rome and Cahaba Thrust Fault with (?) Coosa (Flatwood) Shales and along the other fault with the Upper Silurian, Devonian, and Sub-carboniferous strata of the monoclinal mountain. In this narrow strip there is a large deposit of stalactitic or columnar limonite in the south-east corner of S. 17, T. 9, R. 11 E. This ore is made up of columns about ½ inch in diameter that are cemented together. The interstices between the columns are sometimes filled with a light powder. This ore has sticking to it shining quartz crystals, though it is a much better ore than it looks to be. Its boulders ve some resemblance to old weathered stumps and gs. The deposit has many beautiful cabinet specinens. An average sample of it, dried at 110 deg.,C. gave the following analysis:

Ferric Oxide	73.017
Silica	9.972
Phosphoric Acid	0.730

Analyst, J. L. Beeson.

An extensive deposit of this same kind of ore is said to occur in the N. W. ¼ of S. 12, T. 9, R. 10 E. Extensive deposits of limonite are said to occur also in S's 16 and 18, T. 19, R. 11 E.

The belt of this formation just to the south-east of the great body of flatwoods along the Coosa River is especially broken and cut up by faults. It is of the north-west side of a broken and very badly faulted synclinal, and, as a whole, it appears to have been thrust over towards the north-west on top of (c) Coosa (Flatwood) Shales. It may be said to be bounded by a compound thrust or a fault that is made up in a great measure, at least, of the curved ends of minor thrust faults that run up into and sometimes through the belt in a general north-northeast and south-southwest direction. It has running up into it along many of these minor thrust faults patches and points of older and younger strata. Some of its high points or mountains have been named, as the Coloma Mountain," "Craig Mountain," etc.

This belt abounds in limonite banks. It also has the most extensive as well as the majority of the bauxite deposits known of in the State. Many of these limonite and bauxite banks have been worked very extensively. They occur almost exclusively along faults. They are and large along the south-east

ore over the surface, is to be seen in
S. 34, T. 12, R. 9 E. It is in a
very broken country near the center of
This deposit has been dug into in
ore is principally in large boulders
part rocky or cherty. Some of it is
of it is iridescent. It shows some
is in a pinkish and yellowish loam

sink or pond, covering 10 to 12
foot of Mt. Weisner or in the S. E. ¼
R. 9 E., in a north-west projection of this

soft clayey ferruginous variety, makes a
in a gully in the S. W. ¼
of S. 11, T. 12, R. 9 E.
white ore, makes also a small show-
of the Rumsey old houses in the N. ½ of
14, T. 12, R. 9 E. This last outcropping
extensive one of limonite.

boulders of red ore, crops out in the E. ½
S. 13, T. 12, R. 9 E. It is mostly a very
some of it is of very good quality. A
of limonite sets in within a short dis-
east of it and continues towards the east for
yards. The most of this limonite, how-
nothing more than a ferruginous breccia
It has associated with it some large
very good pyrolusite.

crops out in several places in the E ½ of
S. 7, T. 12, R. 9 E. In one of these places,

it shows as a solid patch, 25 to 30 feet in diameter, of boulders. The most of these boulders are of a pinkish clayey looking ore, though some of them are of a good ore. To the south, between 100 and 200 yards, there is a large deposit of limonite in black boulders that, though rocky or cherty, are high in iron. Most of them have white spots of cherty matter.

Bauxite shows also in a couple of places in the N. ½ of S. W. ¼ of S. 6, T. 12, R. 9 E. In the most north-east of these places, it shows as a solid ledge, for 6 to 8 feet across a wash. It is here a pure white ore that is said to have 63% of alumina, and is just to the east of or under a massive ledge of quartzitic chert.

Limonite, principally as gravels, occurs in considerable quantity over the surface along the south-east edge of the broken cherty country in S. 3, T. 12, R. 10 E. This ore is in a deep red loam with some chalky chert. It has been dug some in the north-east part of the section. To the south-east, to the foot of Frog Mountain, there is a rolling valley, about ½ mile broad, of the deep red loam. This loam extends some distance up on the side of Frog Mountain or up to the overlap or great thrust fault between its strata and those of the overlying (f) Red Mountain (Clinton) Formation (Frog Mountain Sandstones) of Frog Mountain. In the upper part of this red loam, there is is a very large deposit of limonite that extends down into the fields or edge of the valley. This deposit might be said to be in a kind of foot ridge to the mountain, its topmost ore, and perhaps the main body of its ore, being on and just under a kind of bench to the mountain. This deposit is principally in the N.W. ¼ of N.E. ¼ of S.10, T.12, R 10 E. The ore is very thick over the surface in places, even down in the field it had to be piled up to enable the ground to be plowed. In places the ground can't even be plowed now on account of underlying boulders. The ore is principally in boulders. It is mainly high in iron, though some of it is sandy and some of it has a cherty look. It is mostly a honey-comb ore, though much of it is compact. Some of it is of concretions with an ore shell enclosing a nucleus of yellowish ochre. Much of it is scaly on the weathered surfaces. The lower ore or that down in the fields appears, as a general thing, to be more compact than that high up on the mountain side, though it is believed to have rolled down from the mountain side. The top ore was dug some little and hauled on a tram way several miles to the East Tennessee, Virginia & Georgia Railroad, at Amberson.

To the north-east, high up on the north-west side of Frog Mountain in the N. E. ¼ of N. W. ¼ of S. 11, T. 12, R. 10 E., there is an other large deposit of limonite. It is along the same overlap or thrust fault, though its ore is quite different from that of the last deposit. It is mainly a compact black and liver colored ore in large boulders. It is high in iron and phosphorus, as can be seen from the following analysis of a good average sample, dried at 100 deg. C.:

Ferric Oxide	73.809
Silica	13.537
Phosphoric Acid	1.329

Analyst:—J. L. Beeson.

Limonite has been dug in many places in the north-east part of S. 11, T. 12, R. 10 E., between the two prongs of Frog Mountain. These old diggings are in the deep red loam that to the north-east overlies the juncture of this formation and the overlying (c) Pelham Limestones. They continue to the north-east for ¼ mile or more to the very large digging that is known as the Weems Limonite Bank, in the S. W. ¼ of S. 1, T. 12, R. 10 E.

The *Weems Limonite Bank* was connected by tramway with the Rock Run Furnace nearly 3 miles to the north-east. It has furnished an immense amount of ore. Its ore is principally in the deep red sandy loam, though most of its boulders are in pockets of a straw colored sticky clayey loam that is from 15 to 20 feet below the surface. The ore of the surface loam is principally in gravels. Some little of it is in small boulders but none in large boulders. The gravelly ore, especially, is slick or water worn on the weatherd surfaces. The ore is merely screned before roasting preparatory to putting into the furnace. A very large percentage of the ore being fine gravelly ore, much of it goes through the screens to be thrown into the dump piles. It is principally a compact dark liver colored ore that is high in both iron and phosphorus. The following analysis is of a good average sample of the deposit, dried at 100 deg. C.:

Ferric Oxide	83.058
Silica	6.351
Phosphoric Acid	1.460

Analyst, J. L. Beeson.

Limonite banks are numerous in this belt from the Weems Bank on to the north-east to near the State line. They are especially numerous along the south-east edge of the belt, along with the principal bauxite deposits of the State. They are in a broken country and, for the most part, in the deep red loam along faults and over the juncture of this formation and the overlying (e) Pelham Limestones. They have nearly all been dug into more or less. The reported bauxite deposit in the S. W. ¼ of S. W. ¼ of S. 30, T. 11, R. 11 E., is near the south-west end of these numerous banks; the Rock Run or Bass Furnace, in the S. E., ¼ of S. E. ¼ of S. 32, T. 11, R. 11 E., is in their midst; and the remarkable group of limonite and bauxite deposits between two and three miles north-east of the furnace, in the "Dyke District," is near their north-east end.

The limonite and bauxite deposits of the "Dyke District" are remarkable for both their number and size. They are in a very broken and badly faulted country along the north-west edge of the spurs and outliers of the Indian Mountains. They are therefore along close to the big thrust fault that bounds the Indian Mountains on the north-west and along which the mountain strata have been pushed over towards the north-west on top of (2) Lower Silurian strata. In this very broken country, it is almost impossible, on account of the numerous faults and thick residual covering and partly metamorphosed strata, to tell where the one formation begins and the other ends It may be therefore that some at least of these limonite and bauxite deposits belong rather to the top of the (a) Weisner (Chilhowee) Sandstones than to the bottom of this formation.

The "*Dyke Limonite Bank proper*," the largest or most extensively worked of this group of limonite banks, is in the S. W. ¼ of S. E. ¼ of S. 26, T. 11, R. 10 E. An immense amount of ore has been taken from this bank which is an open digging some 200 yards long by 75 yards broad and from 30 to 75 feet deep. Its ore, is strictly speaking in pockets. It is principally a liver colored compact ore, though some of it is porous. It carries also some beautiful specimens of needle ore. Its ore, as a whole, is of good quality, as can be seen from the following analysis of a good average sample, dried at 100 deg. C.

Ferric Oxide	73.547
Silica	12.443
Phosphoric Acid	0.606

Analyst:—J. L. Beeson.

Some small boulders of iron carbonate are said to have been taken from this bank and in it there are spots with iron pyrite. It also has pockets of a slaty or shaly clayey ore, caled *slate* by the miners. The matrix, of light, dark, and mottled colors, is sometimes clayey and sometimes sandy. The north-west side of the digging is of a *white clay-horse* of a very pure white potter's clay with pinkish or ferruginous shaly spots, and with two pockets of a very black rotten lignite that burns with a strong bituminous smell. The bottom or floor of the digging is partly of a bluish quartzite that in places becomes white and friable on weathering. This quartzite looks very much like that at the top of the (a) Weisner(Chilhowee) Sandstones. It is in steep wrinkles and small waves with a north-east and south-west trend, as are the beds of overlying clay and ore. The north-east end of this digging is a large deposit of bauxite, the "Dyke Bauxite Bank proper," that appears to take the place of the white potter's clay or to come in under the limonite and over the quartzite. The covering to the limonite is a mullatto loam with, in places, loose quartzites.

The "*Dyke Bauxite Bank*" is the newest or the last to begin to be worked of the bauxite deposits of the "Dyke District", though its ore was exposed in the mining of the limonite some years ago, before its value was known or when it was known as "iron ore blossom." This bank is owned and worked by the Republic Mining and Manufacturing Company. Its ore, on Sept. 12, 1895, had been dug down into to a depth of 20 feet or more. It shows a distinct stratification, though it is doubtless in an irregular pocket. It appears to be of mound-shape from the intersection of two wrinkled waves or anticlinals with respectively northeast–southwest and northwest–southeast trends, on the south-east side of a large unsymmetrical anticlinal. Its ore stops suddenly on the south-west or towards the limonite bank at a water seam with a north-west and south-east direction, though, to the north-east of this seam for 30 to 40 feet, the bauxite is in places badly mixed with clay. It is also mixed with clay in places away from this seam to a depth of 6 to 8 feet below the surface. In these latter places, the ore occurs as detached boulders in a mottled clay. The body of the ore has in it also some irregular patches of clay and clayey bauxite, though it, as a whole, has a more uniform composition than any other known bauxite deposit. Its ore is principally of the amorphous and fine pisolitic varieties. There is no telling its extent. It is most probably connected with that of an outcropping some 30 to 40 yards to the north-east and it may be connected, across a synclinal trough, with that of the "*Burst Up Bauxite Bank*", some 200 yards to the south-east. It may have once been connected also with an outcropping some 200 yards to the north-west, just over or to north-west of the large anticlinal. If so, the connecting link over the top of the anticlinal has been washed away.

The "*Burst Up Bauxite Bank*" is some 200 yards to the south-east of the "Dyke Bank proper." Its ore also shows a distinct stratification and appears to be mound-shape from the intersection of two wrinkled waves with respectively northeast–southwest and northwest–southeast trends. It has been dug down into to a depth of from 20 to 30 feet and so far as exposed appears to be in two irregular seams that are separated from each other by a very irregular seam of unctuous clay of white, blue, and mottled colors. The upper ore seam has a maximum thickness, on the outcrop, of some 30 feet, and the under seam has been dug down into to a depth of some 20 feet without getting through it. Neither of these seams, however, are believed to be as thick as they appear to be on the outcrop. The lower one has in it some spots of bauxitic clay and some streaks of manganese stain. The following analysis, given by Mr. John H. Hawkins, Supt. of the Republic Mining and Manufacturing Company, are said to be of average samples of respectively the white and red ores of this bank:

	(1)	(2)
Alumina	58.21	40.93
Ferric Oxide	3.60	22.60
Silica	2.90	8.99
Water, combined	31.89	20.43
Titanic Acid	3.40	.....

This bank is not now being worked and so its ore is becoming covered up by debris.

The "*Washer or Taylor Bauxite Bank*" is just to the south-east of the "*Washer or Taylor Limonite Bank.*" It is something over ¼ mile to the south-west of the "Dyke Bank" or is in the S. W. ¼ of S. W. ¼ of S. 35, T. 11, R. 11 E. It is on the property of the Bass Furnace Company and is worked by the Republic Mining and Manufacturing Company. It is not worked now because of the caving in of its sides. The digging is driven into the foot of a spur or outlier of the Indian Mountains and at its southern or back end is some 75 feet deep. It is drained by a tunnel some 600 feet long that starts in at the foot of the hill. Its ore appears to be of a very irregular deposit and little can be said with certainty as to its extent. It is however well defined by walls of clay. It is said to have been continuous in the floor, though the slides have covered the ore of the floor and partly that of the sides. As it now shows in the sides of the bank, however, the ore of the front and back parts of the digging are separated by a *clay horse-back* that is of stratified clay that appears to be of the crest of a wave or anticlinal, with an east and west trend, and to go under the ore on each side. The accompanying Fig. 15 is a rough sketch of the west side of this digging.

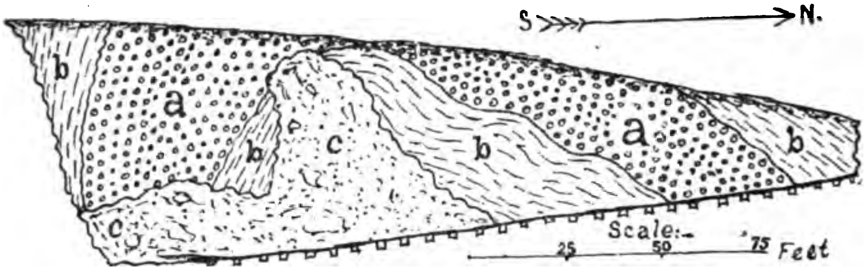

Fig. 15. *Sketch of west side of Washer or Taylor Bauxite Bank.* [a] Bauxite, [b] Clay, [c] Debris.

The ore, though it is believed to be in a very irregular pocket, shows a distinct stratification that is in waves and wrinkles with a north-east and south-west trend. It is of almost every variety, though it is mostly pisolitic and, as a whole, is of very good quality. The upper 20 feet of white and cream colored ores with small pisolites is the best ore, with the exception of an interbedded seam from 4 to 5 feet thick. This best ore is in places hard and firm enough to have a metallic ring. The lower ore is mostly a very coarse pisolitic ore, often coarse enough to be called a pebble ore. In some of it, there are bauxite concretions as large as half-barrels. The lower ore is in places also a pisolitic bauxitic clay and in other places it has one or two interbedded layers of hard flinty nodules with a conchoidal fracture. When these flinty nodules become too numerous, the ore has to be discarded. Some of the bauxitic clay is also hard and firm enough to have a conchoidal fracture and metallic ring.

The *eyes* of the ore of this bank are stained red and are often filled with a loose red siliceous powder. The following analyses are of the ores of this bank :

	[1]	[2]	[3]	[4]	[5]
Alumina............	58.53	61.68	61.00	58.21	53.87
Ferric Oxide........	1.12	1.20	2.20	3.60	8.16
Silica	4.55	2.10	2.10	2.90	4.52
Water, combined & hydroscopic.......	38.20	31.45	31.58	31.89	24.86
Titancic Acid.......			3.12	3.40	

[1] A medium hard ore that is full of soft pink colored *eyes*, concretions. Analyst:—H. B. Cristiansen.

[2] An average sample of the ore with large red *eyes*. Analyst:—Same as [1].

[3] A white uniform ore with only a few *eyes*. The *eyes* are slightly colored. Analyst:—Same as [1].

[4] A nearly white ore with small red *eyes*. Analyst:—Same as [1].

[5] Given by Mr. John H. Hawkins, Supt, of Republic Mining and Manufacturing Company, as about an average analysis of the ores of this mine.

The cover to this ore is an unctuous clay of red and mottled colors. The mottled clay reminds one in looks and feeling of castile soap. These covering clays carry some large angular masses of coarse pisolitic bauxite. Between the clay and bauxite, both over and under the bauxite, there are well defined water seams. The different kinds of clay like the different kinds of bauxite, are in irregular patches or pockets. The drainage tunnel at its head, and for some 200 feet back, is said to have been in or on a bituminous shale or lignite that becomes dingy on exposure, though it readily burns, leaving but little ash.

To the south-west of this bank for some 200 yards, there is a fine surface showing of a deep red bauxite that resemble old under-burnt bricks, and to the north-west of it some 150 yards, in the "*Washer or Taylor Limonite Bank*," there are some large boulders of bauxite.

The "*Gaines Hill Bauxite Bank*" is just over the top of the hill some 200 yards to the north-east of the Dyke Bauxite mine proper. It is owned and worked by the Bauxite Mining and Manufacturing Company. It is cut into the hill from the north-east side. The main body of its ore appears to be of a concretionary pocket that is 50 or more feet in diameter. The concentric strata of this pocket are in wrinkles. The greater part of the ore is of the fine pisolitic variety, though some of it is a coarse enough pisolitic ore to be called a pebble ore. An average sample of the coarse ore, with large concretions, gave, according to Mr. R. Swain Perry, the following analysis:

Alumina	59.91
Ferric Oxide	2.7[illegible]
Silica	1.75
Water, hydro. & combined	32.1[illegible]

The ore of this bank has some interbedded clay seams and the underlying clay has some irregular bauxite boulders. This underlying clay to the north-west of the ore is a mottled clay and to the south of the ore it is a beautiful white clay with halloysite. These clays are separated from the ore by distinct seams. Next to the ore on the north-east, there is, for some 30 feet in thickness, a black carbonaceous shaly clay that appears to be of the outer shell of the large concretionary pocket carrying the ore. Over to the north-east of this shaly clay for 25 to 30 feet, to the surface loam, there are quartzites and quartzitic conglomerates that in places extend down into the shaly clay and in other places are weathered into a beautiful yellow sand. The accompanying sketch, (Fig. 16), with description, is from Dr. C. Willard Hayes' paper on Bauxite, in the Sixteenth Annual Report of the Director of the U. S. Geological Survey.

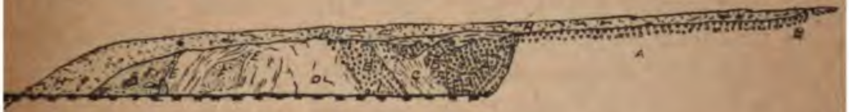

Fig. 16—Sketch of cut on the north-east side of Gains Hill Bauxite Bank.

"A, main ore body; uniform, fine, pistolitic bauxite. B, coarse pisolitic bauxite, white matrix. C, mottled clay, with obscure bedding. D, mottled clay, no banding or bedding. E, yellow ochreous clay with carbonaceous patches and small lenses of lignite. F, coarse yellow sand, with fragments of soft sandstone and seams of manganese. H, sandy clay soil with sandstone debris."

To the south-west of this last bank a short distance, there is an other outcropping of bauxite that appears to be also of a concretionary pocket.

The "*War-whoop Bauxite Bank*", about ¼ mile to the north-east of the Gaines Hill Bank, is about in the south-west corner of the N. W. ¼ of S. 25, T. 11, R. 11 E. It is just to the north-west of the outlying low knolls and ridges of the Indian Mountains. It too is owned and worked by the Southern Bauxite Mining and Manufacturing Company. It had reached a depth, on Sept. 12, 1895, of about 20 feet at its back or deepest part. It is drained by a tunnel that runs into a shaft some 20 feet from the bottom. The shaft is dug on one side of the digging. The ores are of several varieties, in irregular patches, that usually gradually pass one into an other, though they show some stratification. Some of them are full of *eyes* while others have no *eyes* at all, or they range from an amorphorus ore to a coarse pebble ore and from a very soft ore to a hard ore. The change from a soft to a hard ore is very gradual. The different kinds of of ore have received the commercial names of the "*War-whoop Ore*", "*Bird's-eye Ore*", "*Purple Ore*", "*War-whoop Bo-bo Ore*", and "*Hard White Ore*". The *war-whoop ore*, the main ore of the band, is a soft white ore with a dove-colored matrix; the *bird's-eye ore* is the *war-whoop ore* with a decomposed matrix, it is inferior in alumina and is so thrown in the dump pile; the *purple ore* is the *war-whoop ore* stained presumably with manganese, it is also thrown on the dump; the *hard white ore* has a very white matrix; and the *war-whoop bobo ore* is a soft flour like ore of about the same compositon as the *hard white ore*. Along a straight line across the mine, these different ores, according to Mr. R. Swain Perry, Gen. Man. of the Southern Bauxite Mining and Manufacturing Company, once occured as in the following section, commencing with the top ore:

Section across the War-whoop Bauxite Bank.

[10]	*War-whoop Ore*, about	13	feet.
[9]	*Bird's-eye Ore*, about	8	"
[8]	*War-whoop Ore*, about	10	"
[7]	*Purple Ore*, nearly	3	"
[6]	Clay-horse, a little over	3	"
[5]	*War-whoop Ore*, with 3 inches of War-whoop Bobo Ore	3	"
[4]	*War-whoop Bobo Ore*, nearly	3	"
[3]	*Hard White Ore*, nearly	9	"
[2]	*War-whoop Bobo Ore*, soft, something over	2	"
[1]	Clay, underbed, white for several feet and then mottled.		

The following analyses are of ores from this bank:

	(1)	(2)	(3)	(4)
Alumina	64.68	58.25	55.73	61.87
Ferric Oxide	——	1.50	——	2.38
Silica	——	2.22	——	0.49
Water, Comb'd	——	30.00	——	30.50

	(5)	(6)
Alumina	57.00 to 62.00	56.00 to 62.00
Ferric Oxide	under 1.00	2.50 to 3.05
Silica	about 2.50	about 2.50
Water, Combined	29.00 to 30.00	about 30.00

(1) Contains also a trace of manganese monoxide, 0.50 lime, and 4.96 insoluble residue. Analyst:—Illinois Steel Company.

(2) Average of hard ore underlying soft ore. Analyst; R. [illegible] Perry.

(3) Average sample of soft ore over hard ore. Analyst:— Same as (2).

(4) Average sample of ore shipped May 18, 1893. Analyst:—Same as (2).

(5) Average of consumers' analyses of between 500 and 1000 tons of the "hard white ore", shipped in 1893. Analyst:—Same as [2].

(6) Average of car load samples of War-whoop or putty-colored ore. Analyst:—Same as [2].

The accompanying Fig. 17 is of a photograph of one of the drying sheds at the Warwhoop Bauxite Bank.

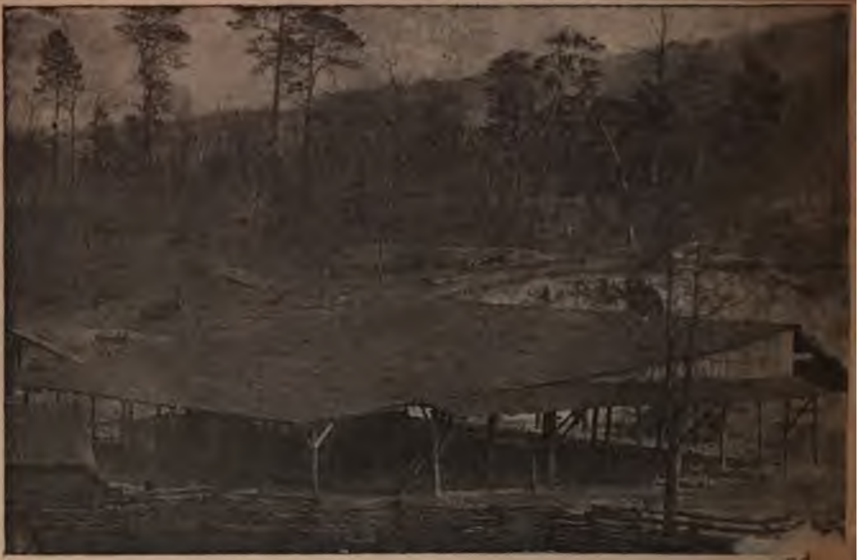

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Fig. 17—Bauxite Drying Shed.

Plate XVIII is of a photograph of the North Warwhoop Bauxite Bank drying house or house with heated revolving iron cylinders through which the ore is passed to be dried.

The following extract and sketch (Fig. 18) with descirption are from an article by Dr. C. Willard Hayes in the Mineral Resources of the United States for 1894:

"A shaft has been sunk on one side of the pit to a depth of 55 feet, and from the bottom of the shaft a tunnel about 50 feet in length runs under the surface workings. This tunnel shows that the ore extends at least 40 feet below the lowest part of the pit.

"About 20 feet from the bottom of the shaft the tunnel cuts through a mass of lignite several feet in thickness. This is dark brown or black, with very low specific gravity, and consists largely of finely comminuted vegetable matter containing many small fragments of charred wood. Some rather large pieces of wood retain their original structure sufficiently for approximate identification. The wood was submitted to F. H. Knowlton for examination. He says of it:

"Very few minute portions were thin enough to permit the structure to be made out. It is undoubtedly coniferons and probably belongs to the genus, *Picea* or *Abies*; in other words, it appears to be a spruce. I am not prepared to venture even a guess as to its age."

"The lignite is not sharply separated from the clay by which it is surrounded, but passes into it through all gradations from the nearly pure vegetable matter through various stages of carbonaceous clay. Several tons of the lignite were removed in cutting the tunnel, and it has been used as a fuel under the boilers, though with indifferent success.

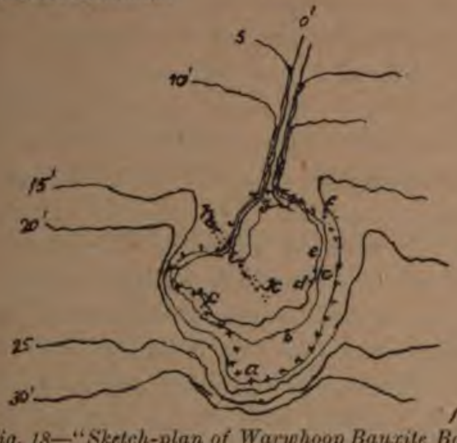


Fig. 18—"Sketch-plan of Warwhoop Bauxite Bank.
Scale:—120 feet=1 inch; 4 foot contours.

"*XXX*, limit of ore body; *a*, coarse pebble ore in contact with yellow clay containing few oolites and bowlders of bauxite; *b*, coarse pebble ore in white matrix; *c*, 3 foot bed of mottled clay in fine oolitic ore, dip N. W. 35 deg; *d*, mass of white kaolin, 5 feet in diameter, in coarse pisolitic bauxite; *e*, soft white matrix with few large pisolites; *f*, mottled clay; *g*, large bowlders and angular masses of pisolitic bauxite in white and mottled clay; *h*, shaft, 55 feet deep; *h-k*, tunnel penetrating ore body, passing through seam of lignite 20 feet from the shaft."

The "*Carr Bauxite Bank*", in the N. E. ¼ of N. W. ¼ of S. 25, T. 11, R. 11, E., is about ½ mile to the northeast of the War-whoop Bank. Its outcrop is principally of large rocky or siliceous looking boulders that are for the most part stained with iron. An average sample of the white or gray ore on the outcrop has been analyzed by Dr. W. B. Phillips, with the following results:

Alumina	39.44
Ferric Oxide	2.27
Silica	37.87
Water, combined	12.80

Dr. Hayes in speaking of this deposit in the Mineral Resources of the United States, for 1894, says:

"The ore body is probably at least 200 feet in diameter, though its outlines can not be definitely determined. The ore is for the most part the oolitic variety, and almost pure white. Most of the oolites are from one-tenth to one-twentieth of an inch in diameter. They are rather loosely imbedded in a soft matrix which only partially fills the interstices. The cavities thus left are lined with a thin film of gibbsite. Under the microscope the ore is seen to contain a large amount of this mineral, which in some cases forms most of the matrix and also replaces portions of the oolites.....The deposit also contains some coarse pisolitic ore consisting of a few rather large simple concretions imbedded in compact white matrix."

To the north of the above Carr Bauxite Bank some 380 yards, on the opposite or north side of the Rock Run and Cave Spring road, there is, according to Dr. Hayes, an other deposit of bauxite. It has not been opened, so he says, but is indicated by fragments of coarse pisolitic ore on the surface.

Bauxite crops out also to the north-northeast near the State line. It has not been dug into. It is called the Estes Bank by Dr. Hayes, who says that no estimate can be made of the extent of this bank, though the ore, in loose fragments, is rather abundant over the surface. The ore, he says, is of the oolitic variety and appears to be of excellent quality.

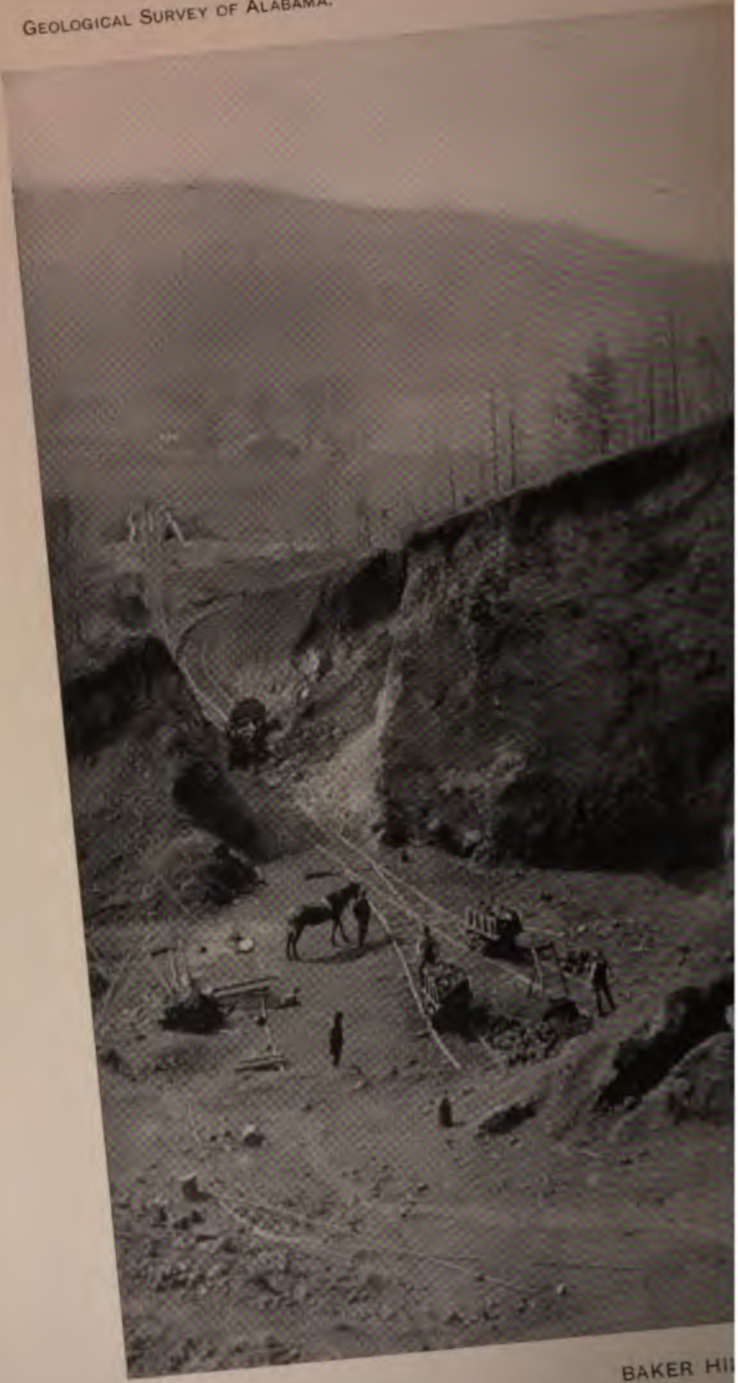
The "*Carr Limonite Bank No. 2*", in the S. E. ¼ of N. W. ¼ of S. 25, T. 11, R. 11 E., is of a cellular ore of fine quality. It is a dark liver colored ore that is partly cellular and partly compact, in a red and yellow loam just south of a vertical white *clay-horse*. An average sample of this ore, dried at 100 deg. C., gave the following analysis:

Ferric Oxide	74.110
Silica	19.097
Phosphoric Acid	0.652

Analyst, J. L. Beeson.

There are no visible rocks around this bank and it may be that its ore belongs at the top of the (a) Weisner (Chilhowee) Sandstones.

The "*Carr Limonite Bank No. 1*," on the side of the Rock Run and Cave Spring Road in the N. E. ¼ of N. W. ¼ of S. 25, T. 11, R. 11 E., is quite different in its surroundings and in its ore from that of the Carr Bank No. 1. It is on the south-east edge of the broken country of Knox Chert ridges and its ore is principally of the *rough* or rocky boulder kind that is a mixture of sandy looking chert and ore. This rough boulder ore will however yield to the hammer a large quantity of good ore. The



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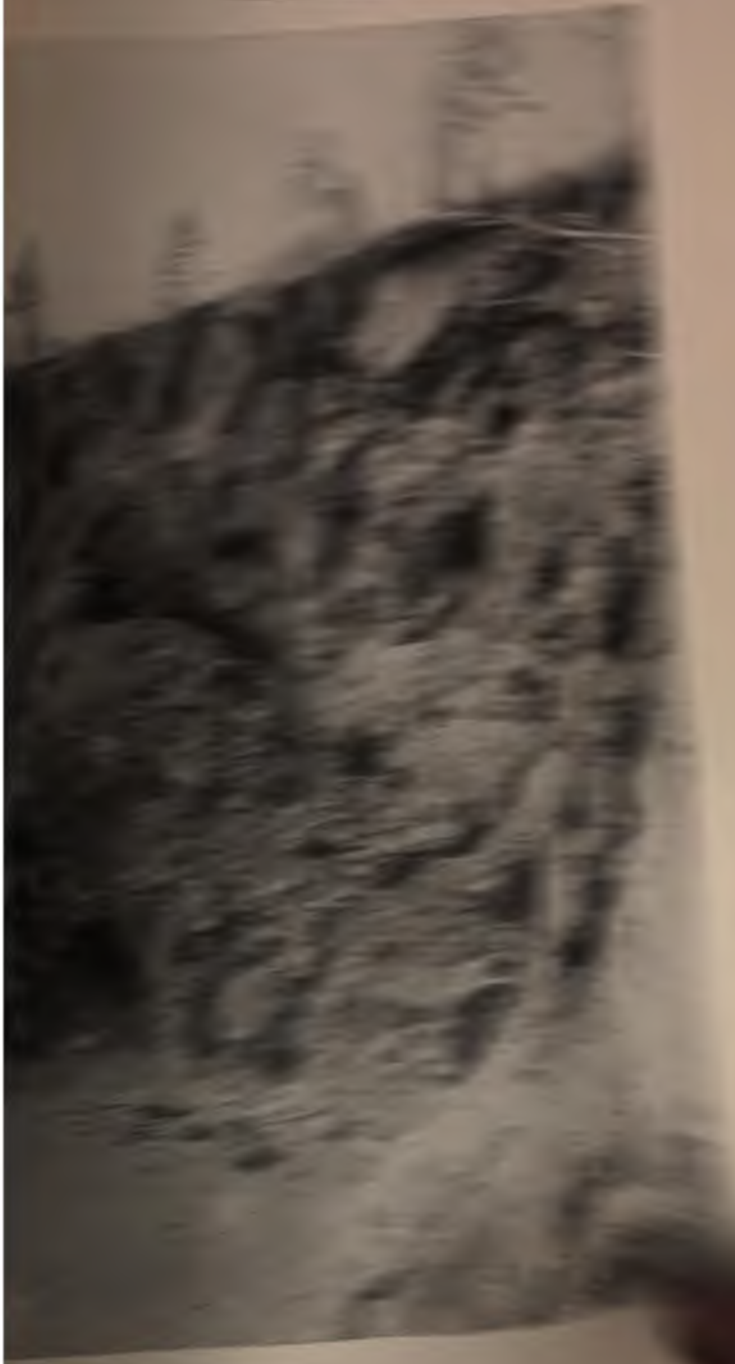

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ood soft or casting iron was wanted. The red clayey haly ore called slate, occurs also in this bank. This ank is almost surrounded by a white *clay-horse*, though he ore in places is in stratified layers with a dip that orresponds to that of the neigboring rocks.

To the east in S. 29, in Cleburne county, there are everal other limonite banks.

The McClung Limonite Bank, in the N.W. ¼ of S.E. ¼ f S. 20, T. 12, R. 12 E., appears to be altogether in ravelly ore.

To the north, along the State line, there are several arge banks in the gravel ore and several others in the black axy boulder ore like that at the top of (a) Weisner Chilhowee) Sandstones. The gravel ore, as a general ing, is of very fine quality, while much of the boulder re is rocky or very siliceous and high in phosphoric cid. They are both in pockets, in a deep red sandy am, that are usually separated by white *clay-horses*.

The following analysis is of an average sample of these res, dried at 100 deg. C.,

Ferric Oxide	59.616
Silica	30.366
Phosphoric Acid	0.748

Analyst:—J. L. Beeson.

There are also in this area along the State line many laces with a great deal of loose ore over the surface hat has come from the outcrops of untouched deposits.

(e) *Pelham Limestones* (*Trenton and Chazy*.) This rmation, from 1000 to 1800 feet thick, is in long narrow elts that are made up of the lower parts of the steep ides of mountains and ridges and of low flat valleys. heir strata to the north-west of the great body of flatwoods, (c) Coosa (Flatwood) Shales, along the Coosa River, are principally gray and blue limestones and calcareous shales, and to the south-east of this great body of flatwoods, principally black fissile shales, *Hayes' Rockmart Slate*. The strata ore often well exposed, especially on the sides of the mountains and ridges. They are, however, on account of their comparative softness often completely hid or covered up, especially in the valleys. The valleys are in places beautiful valleys of fine farming lands while in other places, where badly drained, they are a kind of *flatwoods* with cold, wet, poor, clayey, light colored soils. The most north-west belt is just south-east of Shin-bone Ridge and Little Mountain; the next one, a broader one, is just north-west of the Dirt Seller Mountains; the next one is just south-east of the Dirt Seller Mountains; the next one is just north-west of Gaylors Ridge; and the last and most south-east one is the broken and very irregular valley, to the north-east and south-west of Rock Run Furnace, that is drained by Frog Creek, with some small detached areas to the north-west and south-east of this valley. A better idea of the location and extent of these different belts can be gotten from an inspection of the State Geological Map. The formation makes less than 35 square miles of the surface area of the county.

The belt just south-east of Shin-bone Ridge and Little Mountain appears to be completely engulfed in a fault for a short distance both to the south-west and north-east of Little River. It shows in places the variegated argillaceous limestones (calico rocks), called marble, in both its upper and lower strata.

The belt just to the north-west of the Dirt Seller Mountains is continuous to the south-west to Yellow Creek where it is stopped by a cross fault, though it is partly cut out to the north-east, between Round Mountain and Little River or the south-west end of the Dirt Seller Mountains, by the Rome and Cahaba Thrust Fault. It however occurs to the south-west of Yellow Creek as some small detached patches along the Rome and Cahaba Thrust Fault. Its limestone has been quarried some on the north-west side of Round Mountain and used as a flux in the Round Mountain Furnace.

The belt just south-east of the Dirt Seller Mountains makes a beautiful valley next to the Georgia line of near a mile in width, but becomes entirely engulfed in a fault before it reaches Gaylesville. It also shows outcrops of variegated limestones (*calico rock*).

The belt on the north-west side of Gaylors Ridge shows many fine outcrops of its strata. Its variegated strata of mottled, pinkish, and reddish interstratified limestones and shales, or "calico rocks," show a thickness of about 100 feet.

The irregular valley to the south-west and north-east of the Rock Run Furnace drained by Frog Creek, with its few small detached outliers, is the only one of the belts to the south-east of the great body of flatwoods along the Coosa River and hence is the only one of them that is principally of or, as it may be, that has any of the black fissile shales, Rockmart Slate. It is in the trough of a badly faulted unsymmetrical synclinal. Its strata are badly crumpled up and in places, especially along near the central part of the belt, are covered by irregular shaped mountains, ridges, and hills, of the (f) Red Mountain [Clinton] Formation [Frog Mountain Sandstones].

The limestones form a bluff about 100 feet high at the south-west end of Frog Mountain. They also show up well in places along Frog Creek. They are hard gray and blue rocks with calcite streaks. They are sometimes shaly and sometimes fissile enough to be split up like so much wood. On the weathered surfaces, they most often look sandy, though they have been mined in several places for fluxing purposes, as near the center of the valley in the N. E. ¼ of N. E. ¼ of S. 12, T. 12, R. 10 E.; on the north-west side of the valley in the N. E. ¼ of N. W. ¼ of S. 5, T. 12, R. 11 E. and N. W. ¼ of N. W. ¼ of S. 26, T. 11, R. 11 E.; and in the outlying detached patches in the S.W. ¼ of S.W. ¼ of S. 4, & N. E. ¼ of N. W. ¼ of S. 16, T. 12, R. 11 E. Some of them, however, in places are very sandy, as in these places they are nothing more than porous sandstones on the weathered outcrops.

[3] *Upper Silurian*, [f] *Red Mountain* [*Clinton*] *Formation*. This formation, consisting in a great measure of hard sandstones, is mountain making. Its strata, from 0 to 200 feet thick, however, are quite different to the north-west and south-east of the great body of flatwoods, (c) Coosa (Flatwood) Shales, along the Coosa River. Those to the north-west of these flatwoods carry seams of red ore and, as a formation, are more shaly and softer than those to the south-east of the flatwoods without any ore and of principally hard quartzitic sandstones and conglomerates. Those to the north-west of the flatwoods may be said to make Shin-bone Ridge and its continuation to the south-west, Little Mountain; Dirt Seller Mountain: and Gaylors Ridge; and those to the south-east of the flatwoods make Frog Mountain and the irregular shaped ridges of Frog Mountain Sandstone to the south-west and north-east of that mountain. The formation, within the county, makes less than 35 square miles of surface area.

Shin-bone Ridge and its continuation to the south-west, Little Mountain, is of the steep north-west side of the broad denuded unsymmetrical anticlinal of Broomtown Valley and hence the out-crops of its strata, as a general thing, are narrow or have a steep dip. Its strata are completely cut out by a fault for fully a couple of miles at Yellow Creek.

A good fossiliferous ore with large rounded flint pebbles and with an unctuous feeling, from 6 to 8 inches thick, crops out just within Alabama or in fractional S. 32, T. 6, R. 11 E. Some half mile to the south-west, there are outcrops of two different ore seams. These outcrops are about a dozen yards apart. The north-west or upper seam, about 8 inches thick, is a very fossiliferous ore with smooth rounded flint pebbles of about the size of English peas. The south-east or lower seam, 6 to 8 inches thick, is a good ore that is also very fossiliferous. About a mile still farther to the south-west, these same two seams crop out about as above.

The following outcropping occurs in the south-east corner of the N. W. ¼ of S. 13, T. 7, R. 10 E.

(4) Shales; visible	3 ft.
(3) Shale, *Ore;* mixed	1 ft. 4 in.
(2) *Ore;* good	0 ft to 10 in.
(1) Shale; underbed.	

The following outcropping is to be found in the N. E. ¼ of S. W. ¼ of S. 27, T. 7, R. 10 E:

(5) Shale; cover.	
(4) *Ore*	2 in.
(3) Shale, *Ore*; ore in thin streaks	8 in.
(2) *Ore*	12 in.
(1) Shale; underbed.	

At Ebenezer Church, in the S. E. ¼ of S. E. ¼ of S.28, T. 7, R. 10 E., there is the following outcropping:

(11) Shale	3 ft 0 in.
(10) *Ore;* good, soft	5 in.
(9) Shale	1 ft. 3 in. to 1 ft. 4 in.
(8) *Ore*, Shale; mixed	1 ft. 3 in.
(7) Shale, debris	2 to 3 ft.
(6) *Ore*	thin.
(5) Debris, Sandstone, Shale; about	50 ft.
(4) Loam; deep red, may cover *ore*	1 ft.
(3) Shale, *Ore*; ore in thin streaks	8 in.
(2) *Ore;* good	7 in.
(1) Shale underbed.	

The upper 4 to 5 inches of an ore outcropping, 14 to 15 inches thick, in the S. E. ¼ of S. W. ¼ of S. 33, T. 7, R. 10 E., is not so good as the lower 10 inches. There is just over this outcropping a dark shale about 1 foot thick that may have some ore in it. The ore of an outcrop some 200 yards to the south-west is about 23 inches thick, though its upper 13 inches is shaly.

Blocks of ore, from 2 to 6 inches thick, are to be seen loose over the surface at Davis X Roads. They are believed to come from several thin seams. There is also considerable loose ore over the surface in the N. W. ¼ of N. E. ¼ of S. 35, T. 8, R. 9 E. Over this last ore, there is a light gray sandstone that in places is hard enough to make very good millstones. It splits very well and many millstones have been made out of it. The surface of one of its loose boulders was seen to be cut up into diamond-shape figures by parallel markings about 5 inches apart that extended from 2 to 3 inches down into the rock.

A good ore, in loose pieces, occurs on the south-east side of the ridge in the north-west corner of S. 16, T. 9, R. 9 E. The ore in the S. W. ¼ of S. 36, T. 9, R. 8 E., is said to be about 2 feet thick. The *big sandy seam* in the N. W. ¼ of S. 2, T. 10, R. 8 E., is some 75 yards to the south-east of the top of Little Mountain. This seam, in the N. W. ¼ of S. 10, T. 10, R. 8 E., forms a low ridge or line of knolls just to the south-east of Little Mountain from which it is separated by a narrow valley of (e) Pelham Limestones. It is therefore here just on the south-east side of an anticlinal and just to the north-west of a fault. Little Mountain along here is entirely of this formation. On its top in the N. W. ¼ of N. W. ¼ of S. 10, T. 10, R. 8 E., there is about the following outcropping:

(6) Shale; cover.	
(5) Shale, *Ore*; dark shale with some ore	2 ft.
(4) *Ore;* sandy, fossiliferous, reported	2 ft.
(3) Debris; about	25 ft.
(2) *Ore;* good, fossiliferous, reported	1 ft. 6 in.
(1) Debris, Sandstone.	

The ore in the N. E. ¼ of S. 19, T. 10, R. 8 E., is said to be from 16 to 18 inches thick.

There is only one seam of ore known of in Little Mountain in the S. E. ¼ of N. W. ¼ of S. 19, T. 10, R. 8 E. It is from 9 to 15 inches thick. In the gap through the mountain near the county line or in the N. W. ¼ of S. W. ¼ of S. 19, T. 10, R. 8 E., there is about the following outcropping:

(5) Debris, Sandstone.	
(4) *Ore;* good, compact	1 ft. 6 in
(3) Shale; dirt	1 to 2 in
(2) *Ore*	5 in.
(1) Shale, Sandstone.	

Dirt Seller Mountains are an unsymmetrical synclinal mountain that is cut off or is stopped on the south-west by the Rome and Cahaba Thrust Fault in a great transverse curve. Its top is of the strata of this formation that extend to the south-west for a few miles into Alabama, to where its trough becomes a valley (Dutch Cove) of Sub-carboniferous strata that divides the mountain or this formation into two unequal prongs. The north-west prong is longer and broader than the south-east one, because it is not so soon cut off by the Rome and Cahaba Thrust Fault and because its strata are not so steep and are not cut out by a minor fault, as in the case of the south-east prong. The south-east prong is cut out for the most part before it reaches Gaylesville by the minor fault, whereas the north-west prong holds its own to the south-west to Little River or until it strikes the Rome and Cahaba Thrust Fault. The north-west prong has detached representatives along the Rome and Cahaba Thrust Fault for a long ways to the south-west, as the Round Mountain of this county, the Leeth Mountain of Etowah county, the Canoe Creek Mountains of Etowah and St. Clair counties, and the Cedar Mountain of St. Clair county.

Round Mountain, in S. 33, T. 9, R. 9. E., is about ½ mile in diameter at its base. Its south-east side or top strata are of this formation with, so far as known, one seam of ore. This ore seam on the south-west side of the mountain, at the Ford New Bank in the N. W. ¼ of N. W. ¼ of S. 33, T. 9, R. 9 E., has about the following outcropping:

[6]	Shale; cover.	
[5]	*Ore*; soft, upper bench	6 in.
[4]	Shale, *Ore*	12 in.
[3]	Shale yellowish	18 in.
[2]	*Ore*; reported to be 2 feet in places, lower bench	14 in.
[1]	Sandstone.	

This ore, at the south-east foot of the mountain near the Round Mountain Furnace in the S. E. ¼ of N. W. ¼ of S. 33, T. 9, R. 9 E., is so near the surface that it has been extensively surface dug. The dip here, about 30 deg. to the south-east, is not much greater than the south-east slope of the mountain. At the mouth of a drift low down on the side of the mountain near the furnace, there is about the following ourcropping:

(9)	Shale; cover.		
(8)	*Ore*; soft, good, upper bench		18 in.
(7)	Shale, *Ore*		8 in.
(6)	Shale		16 in.
(5)	*Ore*	lower bench	5 to 6 in.
(4)	Shale		1 in.
(3)	*Ore*		5 to 6 in.
(2)	Mining; a solt black sandy material		2 in.
(1)	Sandstone.		

About 100 yards higher up on the side of the mountain, in some surface diggings, there is about the following outcropping:

(8)	Shale; cover.		
(7)	*Ore*; good, upper bench		9 in.
(6)	Shale; *Ore*		13 in.
(5)	Shale; gray		15 in.
(4)	*Ore*	lower bench	2 in.
(3)	Shale		1 to 2 in.
(2)	*Ore*		27 in.
(1)	Sandstone.		

In these diggings some 15 to 20 feet higher up the mountain, there is about the following outcropping:

[11]	Shale. Cover; visible		10 ft.
[10]	*Ore*; good, soft, upper bench		8 in.
[9]	Shale; *Ore*		14 to 15 in.
[8]	Shale: gray		12 in.
[7]	*Ore*	lower bench	1 to 2 in.
[6]	Shale		2 in.
[5]	*Ore*		4 in.
[4]	Shale		4 to 5 in.
[3]	*Ore*		12 in.
[2]	Mining, *Ore*: soft black sandy material with some little ore in places		5 to 6 in.
[1]	Sandstone.		

Average samples of the Round Mountain ores, dried at 100 deg. C., gave the following partial analyses:

	(1)	(2)	(3)
Ferric Oxide	85.348	76.875	81.816
Silica	5.458	7.570	11.591
Phosphoric Acid	0.476	0.320	0.171

[1] A leached ore with a few of the small flattened rounded pebbles. Average sample of the Lower Bench at the Ford New Bank.—Analyst:—J. L. Beeson.

[2] A well leached ore with yellow ochre colored specks, the remains of fossils, Average samble of Upper Bench at Round Mountain Furnace. Analyst:—J. L. Beeson.

[3] A well leached ore with a few very small flattened rounded flint pebbles. Average sample of Lower Bench at Round Mountain Furnace. Analyst:—J. L. Beeson.

The dip in these surface diggings is about 5 feet in 18 feet to the south-east.

The Rome and Cahaba Thrust Fault runs along the south-east edge of the north-west prong of the Dirt Seller Mountains until it strikes the Chattooga River at the *narrows* in the N. W. ¼ of N. W. ¼ of S. 20, T. 9, R. 10 E., where it leaves the mountain and takes up the river to Gaylesville, cutting off or stopping the remnants of the south-east prong of this formation along the minor strike fault, a short distance to the north-east of the Stonewall old furnace in the N. W. ¼ of S. 21, T.9 , R. 10 E.

The Dirt Seller Mountains do not appear to have but one good seam of ore. This ore is in the upper strata of the formation. It crops out just south-east of the crest of the mountain in the S. E. ¼ of S. E. ¼ of S. 18, T. 9, R. 10 E., where it is a compact fossiliferous good ore that is said to be 15 inches thick, though it showed a thickness of only about 6 inches. In a ravine in the

S. W. ¼ of S. W. ¼ of S. 17, T. 9, R. 10 E., there is the following outcropping:

(4)	Sandstone; massive and flaggy, near	100 ft.
(3)	Shale	60 ft.
(2)	*Ore;* very fine quality, about vertical	11 in. to 1 ft.
(1)	Shale; visible, some	75 ft.

Red ore, in loose pieces from 8 to 10 inches thick, occurs along the road near the top of the Puckett Gap in the S. E. ¼ of S. 8, T. 9, R. 10 E. This ore has in it flattened rounded grains of siliceous matter. It may come from an outcropping here of a sandy ore with rounded flinty grains that is hard and compact, somewhat like a brown ore.

The *sandy seam* in its outcrop on the north-west side of the mountain, in the Gaylesville road in the N. W. ¼ of S. 3, T. 9, R. 10 E., is from 70 to 75 feet over the variegated limestone or *calico rock* of the [e] *Pelham Limestones*. In this outcropping, about 9 feet thick, the lower half is a massive yellowish brown compact fine grain ferruginous sandstone while the upper half is a coarse grain ferruginous sandstone that is more or less friable. Some 350 feet over this *sandy seam*, with shales and sandstones between, there is to the south-east of the crest of the mountain an ore outcropping that was worked considerably, by surface diggings and by drifts, when the Cornwall Furnace was in blast. The ore here is reported to be 3 feet thick in places, and 2 feet thick in other places, and to have an average thickness of 2 ft. 6 in. Its full thickness was not seen, though in one place in the old diggings, it showed up about as follows:

(5)	Shales; cover.	
(4)	Sandstone	13 in.
(3)	*Ore;* very good	12 to 13 in.
(2)	Shale	12 in.
(1)	*Ore*; good visible to a depth of	5 in.

The change from the sandstone [4] to the ore [3] is gradual, without any plane of stratification between the two.

About one-half mile to the north-east, there are some old surface diggings in which the following outcropping was seen.

(6)	Shale, Sandstone; cover.	
(5)	*Ore*; sandy in places	5 in.
(4)	Shale; reported to be only in places	5 in.
(3)	*Ore;* good	11 in.
(2)	Clay; visible	2 in.
(1)	Debris; may hide some ore.	

In this outcroping also, there is no plane of stratification between the ore [5] and the overlying sandstone that is more or less ferruginous.

Average samples of the ores from the above diggings, dried at 100 deg. C., gave the following analyses:

	(1)	(2)
Ferric Oxide	70.883	72.722
Silica	12.144	15.054
Phosphoric Acid	1.326	1.141

[1] A fine grain leached ore with occasional coarse grains or small flint pebble. Upper bench. Analyst:—J. L. Beeson.

[2] A leached ore with some small flattened rounded flint grains and some large ones. Lower bench. Analyst:—J. L. Beeson.

The above analyses show these ores to be unusually high in phosphorus, especially for red ores.

Ore, in abundance in loose nodules, occurs over the side of the mountain in the S. E. ¼ of N. W. ¼ of S. 25, T. 8, R. 10 E. It is believed to have come from the outcropping of a seam from 12 to 18 inches thick.

An ore outcropping was seen in the S. W. ¼ of S. E. ¼ of S. 19, T. 8, R. 11 E., and, in the Mill Creek Gap in the S. E. ¼ of N. W. ¼ of S. 17, T. 8, R. 11 E., there is another one about as follows:

(7)	Shales, cover.	
(6)	*Ore*	0 to 2 in.
(5)	Shale	8 in.
(4)	*Ore*	8 in.
(3)	Debris	2 to 8 ft.
(2)	Sandstones, Shales	55 ft.
(1)	Ferruginous Sandstone	8 ft.

The ore of [4] is used some for the backs of fire places, as it is a very good fire-proof material. This seam of ore is believed to thicken towards the north-east, as the top of the mountain near the State line is covered in places, at least, with loose pieces of good ore. This loose ore is mostly over the gently sloping or north-west side of the synclinal trough. The overlying strata of this formation, shales with some interstratified sandstones, are over 300 feet thick.

The south-east prong of the Dirt Seller Mountains has near its north-west end, in the gap made by Mill Creek near the center of S. 20, T. 8, R. 11 E., an outcropping of a siliceous ore seam about 18 inches thick. To the south-west or in the N. W. ¼ of N. E. ¼ of S. 29, T. 8, R. 11 E., there is considerable loose ore over the north-west side of this south-east prong. It comes from a seam high up in the formation, doubtless the same seam as the one near the State line.

Near the Widow Triggs in the N. W. ¼ of N. W. ¼ of S. 29, T. 8, R. 11 E., there is the following outcropping:

(4)	Sandstone; cover	18 in.
(3)	*Ore;* ledge	8 to 9 in.
(2)	*Ore;* ledge	6 in.
(1)	Sandstone.	

Just south of this last outcropping, there is another, of the same ore seam, about as follows:

(3) Sandstone; cover..........................8 to 10 in.
(2) *Ore*; ledge..........................14 in.
(1) *Ore*, Sandstone; the upper 6 inches ore.

The ore and sandstone of (1) have no plane of stratification between them, they gradually pass into each other.

The ore outcrops in the S. E. ¼ of S. 30 and N. E. ¼ of S. 31, T. 8, R. 11 E., are of good but thin ores.

The south-east prong of Dirt Seller Mountains stops as a continuous mountain at a little creek in the N. E. ¼ of S. 11, T. 9, R. 10 E. To the south-west of this creek, it is partly cut out by the minor strike fault, or is of short ridges with gaps between, to where it becomes cut out entirely by the Rome and Cahaba Thrust Fault in the S. W. ¼ of S. W. ¼ of S. 15, T. 9, R. 10 E.

Two seams of ore are in the short ridge in the south-east edge of Gaylesville or in the S. E. ¼ of S. 11, T. 9, R. 10 E. Their ore is said to be about 2 feet thick in places, though the thickest seen of their ore, in the partly filled pits, was only from 12 to 14 inches thick. It is of good quality. It is more than vertical or is bent over towards the north-west until it has a south-east dip on the outcrop. Near the north-east end of this short ridge or in the S. E. ¼ of S. E. ¼ of S. 11, T. 9, R. 10 E., the ore appears in one place as a ledge about 8 inches thick; in an other place in two ledges, of from 4 to 6 inches each in thickness, that are separated from each other by about 12 inches of shale; and in still an other place as two ledges, respectively 4 and 8 inches thick, that are separated from each other by 4 inches of loam. The ore of these outcrops is of good quality.

In the next short ridge to the south-west, there is a reported outcropping of ore with a drift in it in the N. E. ¼ of S. 15, T. 9, R. 10 E. To the south-west, in a gap of the ridge in the N. E. ¼ of S. W. ¼ of S. 15, T. 9, R. 10 E., there is an outcropping of good ore in a ledge about 8 inches thick. This outcropping is also more than vertical or is pushed over towards the north-west until it has a dip of 60 to 70 deg. to the south-east.

Red ore is reported to be on a knoll in the south-east corner of S. 17, T. 9, R. 10 E., but this is doubted

Gaylors Ridge, within Alabama, is a monoclinal mountain or the more gently sloping north-west side of an unsymmetrical synclinal whose steep and badly crumpled south-east side has been engulfed in the Rome and Cahaba Thrust Fault. It therefore gradually slopes from the elevated crest along its north-west edge to the south-east to the general level of the country. The south-east slope of the mountain is not much less than the general south-east dip of the strata and so its surface rocks are principally of the uppermost strata of this formation. The steep north-west side of the mountain, with its capping bluff of massive yellowish and red ferruginous sandstones and conglomerates, is also principally of the strata of this formation which are here some 400 feet thick. They however do not appear to have any good ore in them, though in their upper part there is a seam of siliceous pebble ore that has doubtless given rise to the loose pieces down on the north-west side of the mountain. On the gentle south-east slope of the mountain, there are some loose nodules of a velvety limonite with sandy seams. On this south-east side of the mountain, there is, in the N. W. ¼ of S. 17, T. 9, R. 11 E., a slide several hundred yards long that is said by some of the neighbors to be a crack, that was produced by the earthquake of 1886.

irregular shaped ridges of *Frog*
the north-east and south-west of
n put down on the State Geolo-
to to this formation, though Mr.
em as Devonian. Their strata
appearance of being of our Red
Formation, and no characteristic
n found in them to my knowledge.
are principally Oriskany, the tran-
the Silurian and Devonian rocks re-
na to the Upper Siluian, and that the
nton] Formation, as recognized in Ala-
Oriskany. Their uppermost beds, a few
w places, may be true Devonian rocks, but
to believe that the great mass of their
an. Their location and extent can be
n inspection of State Geological Map.
nes, in a general way, are massive at
flaggy at the top. The massive rocks are
hard cherty looking or quartzitic sand-
almost white, though they are sometimes
ay or granite appearance. They are both
rse grain rocks. The coarse grain rocks
look and are often fine conglomerates
of about the size of coarse pin heads. The
weathering have a dull ashy gray color.
to be calcareous and to give rise to a deep
am. These sandstones, both of the massive
kind, are occasionally of a delicate pink color.
atly have on their weathered surfaces prom-
aks of commonly flinty matter, though occas-
limonite. They are sometimes ferruginous.
so in places to be rocky or cherty limonite in
y very rough boulders. No red ore has been seen

in any of their mountains and ridges. Frog Mountain proper is of three ridges with a general north-northeast and south-southwest trend and with an eastern dip, though the most eastern ridge is bent around at is northern end into the shape of a pruning hook. These three ridges, separated from each other by faults, hollows, and low gaps, have a general slope from their steep northern ends towards the south.

(4) *Devonian.* (g) *Black Shale.* This formation, as a narrow belt of black bituminous shale from 15 to 50 feet thick, crops out along the Shinbone Ridge and Little Mountain, usually just south-east of their crests; and around the outer edge of the synclinal trough, including "*Dutch Cove*"*, within the Dirt Seller Mountains; and along the south-east foot of Gaylors Ridge. There is just under this shale in places a black bituminous sandstone with balls of iron pyrite. The shale carries more or less iron pyrite which has been taken for copper, silver, etc., by the mineral hunters who have in several places sunk deep shafts down into the shale after the supposed silver, etc. This pyrite gives rise to the sulphur and chalybeate springs.

None of this shale has been in Cherokee county to the south-east of the great body of flatwoods, [c] Coosa [Flatwood] Shales, along the Coosa River, though the most south-east seen, that along the south-east foot of Gaylors Ridge, is perhaps the thickest seen. Some however of the uppermost of the Frog Mountain Sandstones to the south-east of these flatwoods are probably, as has been said, Devonian.

[5] *Lower Sub-carboniferous.* [h] *Fort Payne Chert.* This formation, from 25 to 250 feet thick, is less cherty and thinner than it is farther to the north-west. It is a difficult matter to tell in places where it begins and

[illegible] th-west of the great body
[illegible] River, it covers the north-
[illegible] tops of Shinbone Ridge and
[illegible] narrow fringe around the
[illegible] rough within the Dirt Seller
[illegible] irregular patches along
[illegible] aylors Ridge. To the south-
[illegible] and to the south-west of
[illegible] some very narrow belts that
[illegible] The formation does not cover
[illegible] of the surface area of the

[illegible] the State line, the cherty
[illegible] bottom of the formation show to
[illegible] feet. Under these cherty strata
[illegible] are in places a few feet of sand-
[illegible] plastic clay and, in other places, a
[illegible] blue shaly limestone that on
[illegible] looks like a brown sandstone.
[illegible] around the outer edge of the syncli-
[illegible] Dirt Seller Mountains are com-
[illegible] gh they are thicker in places than
[illegible] They also show just under them in
[illegible] a few feet in thickness. Under
[illegible] was seen a greenish gray argilla-
[illegible] doubtless takes the place of the
[illegible] other places. Just over these cherty
[illegible] many places, especially along the
[illegible] the synclinal trough, outcrops of gray
[illegible] limestones with interstratified rows
[illegible] These limestones most probably be-
[illegible] the formation, corresponding to the
[illegible] umbia Limestones of the Tennesse

Valley. They give rise to a red loam with the imbedded cherty nodules.

The patches along the south-east foot of Gaylors Ridge are small, irregular, and thin. They in places are in contact along a fault on the south-east with [d] Siliceous [Knox] Dolomite and Chert.

The very narrow belts to the south-west of Frog Mountain are mainly of a calcareous flaggy sandstone of a dull ashy gray color and a cherty limestone, though they show some outcrops of cherty ledges. The flaggy sandstones and cherty limestones may possibly be [6] Upper Sub-carboniferous strata. About between these sandstones and limestones, there are some strata so maganiferous as to make the surface soil perfectly black.

[6] *Upper Sub-carboniferous.* This formation, from 1000 to 1900 feet thick, is of its two contemporaneous phases, [1] Bangor Limestones and [2| Oxmoor Shales and Sandstones. It forms to the north-west of the great body of flatwoods, [c] Coosa [Flatwood] Shales, along the Coosa River, the greater part of the Shinbone and Owl valleys, the narrow valleys between Lookout Mountain and respectively Shinbone Ridge and Little Mountain; the greater part of the synclinal trough between the two prongs of the Dirt Seller Mountains; and an irregular patch along the south-east foot of Gaylors Ridge. To the south-east of the above flatwoods, it makes a considerable valley that extends from just south-west of Frog Mountain to the south-west down into Calhoun county. Its strata cover some 30 square miles of the surface area of the county.

The Shinbone and Owl valleys, being principally of comparatively soft strata, shales and limestones, and being on the north-west side of a steep unsymmetical anticlinal, do not show many fine outcrops. These same strata however show very well in the synclinal trough between the two prongs of the Dirt Seller Mountains. They here make a red clay soil. The limestones, blue and gray, carry interstratified layers of cherty nodules. Their outcrop near the center of N. E. ¼ of S. 16, T. 9, R. 10 E., was quarried some as a fluxing rock for the Stonewall old furnace. These limestones make a considerable mountain in the N. E. ¼ of N. W. ¼ of S. 1, T. 9, R. 10 E.

The patch along the south-east foot of Gaylors Ridge, so far as has been seen, is of the Oxmoor Shales and Sandstones, without any limestones.

The valley to the south-west of Frog Mountain is of both shales and limestones. It is a faulted synclinal trough with north-west and south-east rims of a red loam and of flaggy and massive sandstones. The flaggy sandstones are of the north-west rim. They are the dull ashy gray rocks. The massive sandstones are of the south-east rim; they are the hard white cherty looking or quartzitic sandstones. These sandstones have been mapped as (f) Red Mountain (Clinton), though some of them may turn out to be of this formation.

(7) *Carboniferous*, (j) *Coal Measures*.—The Coal Measures of this county are of the top of Lookout Mountain. This mountain is of an unsymmetrical synclinal trough with a much steeper and narrower south-east than north-west half. The Coal Measures of this county are therefore most elevated along the south-east rim of the mountain, where they are from 900 to 1100 feet above the Coosa River. These measures cover some 150 square miles of the surface area of the county, their

surface rocks being principally of the *Upper* and *Lower* conglomerates of Tennessee. They are therefore almost wholy of these conglomerates and of the shales, sandstones, and coals between these conglomerates and under the lower one. They have a maximum thickness of near 400 feet. The most of this thickness can be seen along the deep ditch-like gulches of Little River and Yellow Creek. Fully ½ of it is sub-conglomerate. These measures have four seams of coal, perhaps five in places. Two of these seam are sub-conglomerate and two are inter-conglomerate. They are too thin to be of any other than local value, though it is said that in places the Upper Conglomerate seam, the *Cliff or Main Etna Seam*, is 2 feet thick, and that the lower sub-conglomerate seam, the *Dade or Eureka Seam*, is 4 feet thick. These thick or workable places however are merely unreliable bulges or pockets in the coals, as in this county the sub-conglomerate seams are usually from 8 to 14 inches thick and the inter-conglomerate seams are usually from 6 to 10 inches thick. The lower inter-conglomerate seam, the *Sewanee Seam*, however, gets to be 20 inches thick in places.

Limonite, as a spongy siliceous ore, shows in many places loose over the surface along the outcrop of the *Cliff or Main Etna Coal Seam*. It is doubtless an altered carbonate from the outcrop of a stratified seam. Flagstones, well suited for paving purposes, are to be found in many places on the mountain.

The gulch of Little River below "*The Falls*" for some ten miles is a huge ditch-like depression with vertical walls. It is about ¼ mile broad and from 200 to over 300 feet deep. It is almost an impassable barrier, as it can be crossed, and that with difficulty on foot, in only a few places. Its sharpness of outline is due to the surface rock being the very hard and massive Lower Conglomerate (Millstone Grit) that breaks off in bluffs from 75 to 100 feet high.

[8] *Tertiary*, [k] *Lafayette*.—The silt, sand, and rounded gravels that cover unconformably a great deal of the flatwood strata along near the Coosa River are believed to be of this formation. These materials are in irregular patches on both the high and comparatively low lands. They are however especially abundant over the higher points, the ridges, hills, and knolls, of the flatwoods, from 50 to 200 feet above the river. They give rise to a regular piney woods. The silt is commonly of an ashy gray color from presence of organic matter; the sands are of light yellowish, orange, and red colors; and the rounded pebbles, in the order of their abundance, are of chert, flint, and sandstone. The chert pebbles, frequently oolitic and almost wholly of the [d] Siliceous [Knox] Chert, are often more or less angular with smooth or rounded edges, while all of the flint pebbles are perfectly smooth and well rounded. Many or most of the flint pebbles have a black exterior, some of them are red within. These materials occur over the top of the hill under Center about as follows:

Outcropping at Center.

(5) Loam; sandy, light yellowish	4 ft.
(4) Loam, Sandstone; bright red sandy loam with thin seams of bright red sandstone, about	10 ft.
(3) Loam, Pebbles; light, yellowish, and reddish sandy loams with some few rounded pebbles	5 to 6 ft.
(2) Pebbles; rounded, of chert, flint, and sandstone	4 to 5 ft.
(1) Clayey Shale; light and mottled colors, unconformable to (2), weathering into a very good plastic clay in places, *Cambrian*	

CHAPTER XV.

CLEBURNE, COOSA, AND CHILTON COUNTIES

These counties are almost wholly in the Crystalline or Metamorphic Belt, though they each extends far enough north to include small portions of well known Paleozoic strata of the Coosa Valley Region, as can be seen from the State Geological Map and from the Sketch Map of the State, Plate I, Part I, of this report. The most south-east of their Paleozoic strata, separated from the Crystalline or Metamorphic Belt by merely a great overthrust fault, Talladega Fault, are more or less metamorposed themselves. Only their indisputable Paleozoic strata and the north-west edge of their Crystalline or Metamorphic belts, will be considered in the following pages.

CLEBURNE COUNTY.

The well known Paleozoic strata of the Coosa Valley Region cover nearly 50 square miles of this county. These strata are of the Weisner Formation with the exception of 2 or 3 square miles of the Siliceous [Knox] Dolomite and Chert and perhaps some narrow patches along faults of the lower strata of the Montevallo [Variegated] Shale and Sandstone.

The *Weisner Formation* in this county is of the Terrapin Mountains. It is made up for the most part of a series of broken mountains with a general north-east and south-west trend that are separated from each other by faults and often by narrow broken valleys. These mountains have in their upper strata in many places deposits of limonite and pyrolusite, occupying the same geological horizons. These deposits are just to the south-east of or just over a massive quartzite or conglomerate. They appear to start up and to stop suddenly, though they are the outcrops of stratified ledges or seams. The largest, so far as has been seen, of the manganese or pyrolusite deposits, is in Lot 19, S. 33, T. 12, R. 11 E. It has been dug into to a considerable extent. Some of the diggings had a fine showing of ore, while others had no ore at all. The principal one of the diggings had, when visited, thrown out of it and piled up around it, 25 to 30 tons of ore that is said to have carried 58 per cent. of manganese oxide. A sample of this ore, selected by the writer, gave however a larger per centage of manganese, as shown by the following analysis:

Silica	3.670
Ferric Oxide	9.643
Manganese Peroxide	62.554

Analyst:—J. L. Beeson.

This ore is in a stratified layer of boulders and gravels, with some intermixed boulders of quartzite, in a red sandy loam. The ore of some of the other diggings is not near so good. It is said to carry less than 25 per cent. of manganese peroxide. It is rough ore or is of boulders of quartzite with streaks of very pure manganese ore.

Other deposits of manganese, though smaller, were seen to be south-west of the above one, occupying the same geological horizon.

Limonite deposits were seen also at this horizon both to the north-east and south-west of the above manganese deposit. The limonite deposit to the north-east, in Lots 8 & 9, S. 33, T. 12, R. 11 E., appears to be some 300 yards long by some 50 feet in thickness. It is principally in large boulders that form a bluff. Some of these boulders are almost house-size in dimensions; some of them are of very good ore, while others are partly good ore and partly quartzite, and others still are nothing more than ferruginous quartzites. This deposit would yield to the hammer and hand a vast amount of good ore. Its ore, however, is high in phosphorus, as shown by the following analysis of an average sample, dried at 100 deg. C:

Ferric Oxide	79.920
Silica	9.973
Phosphoric Acid	2.914

Other deposits of limonie were seen still farther to the north-east on this same "*lead*."

The above limonite and manganese deposits are either along the crests or just to the south-east of the crests of the mountains, though there is said to be a limonite deposit on the north-west side of the mountain in the N. E. ¼ of S. 4, T. 13, R. 11 E.

Roofing slate outcrops are said to be in the N.W. ¼ of S. 18, T. 13, R. 11 E. and the N. W. ¼ of S. 34, T. 13, R. 10 E. These outcrops are to the south-east of the mountains and must be in the upper strata of this formation.

The *Siliceous (Knox) Dolomite and Chert Formation* covers about 1 square mile in the extreme north-east corner of the county and a couple of square miles in the corner of the couuty to the south-east of Oxford. That in the north-east corner of the county is of the south-west end of an extensive belt that extends down to the south-west from Georgia until it is stopped by a fault. Along and near this fault, there are some very extensive deposits of limonite. Mauy of these deposits are in a red loam with residual quartzites of the Weisner Formation. It may be that this red loam has been derived, partly at least, from the Aldrich (Beaver) Limestones at the bottom of the Montevallo (Variegated) Shale and Sandstone Formation. Some of these limonite deposits, however, are of this formation. Of these deposits, the Tibbs Bank in the S. W. ¼ of N. W. ¼ of S. 29 and the Brewster Bank in the N. W. ¼ of S. E. ¼ of S. 29, T. 12, R. 12 E., are in this county. The former of these banks is of large boulder ore with specks and spots of sandy matter.

The couple of square miles to the south-east of Oxford are of the lower strata of the formation with some large lime sinks.

COOSA COUNTY.

This county includes in its north-west corner 15 to 20 square miles of well known Paleozoic strata of the Coosa Valley Region. These strata are principally of the broadened south-west end of the synclinal basin to the south-west of the Talladega Sulphur Springs. They are of the following formations:

[4] *Upper Sub-carboniferous*	[g] *Oxmoor Shales and Sandstones.*
[5] *Lower Sub-carboniferous*	[f] *Fort Payne Chert.*
[2] *Lower Silurian*........	[e] *Pelham* [*Trenton*] *Limestones*
	[d] *Siliceous* [*Knox*] *Dolomite and Chert.*
[1] *Cambrain*..............	[c] *Coosa* [*Flatwood*] *Shales.*
	[b] *Montevallo* [*Variegated*] *Shales.*
	[a] *Weisner Quartzites* [*Chilhowee.*]

The *Crystalline Strata* or *Talladega Slates*, believed to be, partly at least, altered Cambrian strata, near their north-west edge in Coosa county carry many outcrops of roofing slate that in places have a good cleavage and are tough enough to be punctured. They also have in them, in the S. W. ¼ of S. 34, T. 24, R. 16 E., a deposit of soft smutty manganese ore with some clay seams and some flattened flint lenses. This deposit has been dug into to a depth of some 15 feet. Limonite deposits are said to occur in them in S's 4 & 9, T. 23 N., R. 6 E.

(a) *Weisner Quartzites.* This formation covers several square miles in Coosa County. It makes the Fay Mountain, a broad mountain that is the extension to the south-west of the Sulphur Spring Mountain. The strata of this mountain, more or less metamorphosed, appear to be in a kind of transition state to the Talladega Slates. They have in them some very little siliceous *gray ore.*

(b) *Montevallo* (*Variegated*) *Shales and Sandstones.* The strata of this formation are also more or less metamorphosed. Its upper or south-east strata form a sharp-crested ridge with a back-bone of massive quartzite or metamorphosed sandstone. This massiva ledge is in places a milky quartz and in other places a very pretty rose colored jasper. Its ridge is stopped on the south-west as it butts up against Fay Mountain or a fault. The bottom strata of this formation, the Aldrich Limestones, form a flat country along Peckerwood Creek above Looney's Mill.

(c) *Coosa* (*Flatwood*) *Shales.* This formation forms a flat valley near ¼ mile broad between the sharp crested ridge of (b) Montevallo (Variegated) Shale on the north-west and the broken country of Talladega Slates on the south-east. Being next to the Crystalline strata or the great overthrust fault, its strata are more metamorphosed than those of the last mentioned formation. Its marbles have been quarried some in the Cooper Quarry in the S. E. ¼ of S. W. ¼ of S. 12, T. 24, R. 16 E. Its strata become engulfed in faults to the south-west. The most south-west visible outcrop of its marble, of a bluish color, is in the S. W. ¼ of N. W. ¼ of S. 13, T. 24, R. 16 E.

(d) *Siliceous (Knox) Dolomite and Chert Formation.* These strata, badly metamorphosed, most probably make the rounded ridge just to the north-west of the Fay Mountain with a narrow broken valley and fault between the ridge and Fay Mountain. This ridge is covered with loose white flinty nodules, with more or less cleavage, that are believed to be metamorphosed chert.

(e) *Pelham (Trenton) Limestones.* This formation forms a low flat irregular belt of 5 to 6 square miles in area that extends around the south-west end of the faulted synclinal trough to the south-west of the Talladega Sulphur Springs. It may also make the bluff of hard, slaty, fetid blue limestones with cherty seams at the north-west foot of the Fay Mountain on the south side of Peckerwood Creek.

(f) *Fort Payne Chert.* This formation occurs only as narrow detached patches along a fault down the central portion of the synclinal trough to the south-west of the Talladega Sulphur Springs.

(g) *Oxmoor Shales and Sandstones.* This formation covers 5 to 6 square miles of the county or the broken faulted piney woods country of the synclinal basin to the south-west of the Talladega Sulphur Springs.

CHILTON COUNTY.

Some 75 to 80 square miles of the northern part of this county are underlaid by Paleozoic strata, though some 20 square miles of this area have a superficial covering of the unconformable Cretaceous (Tuscaloosa) and Tertiary (Lafayette) strata. The Paleozoic strata, so far as they have been recognized, are of the following formations:

(4) *Upper Sub-carboniferous.*	(f) *Oxmoor Shales and Sandstones.*
(3) *Lower Sub-carboniferous.*	(e) *Fort Payne Chert.*
(2) *Lower Silurian*	(d) *Pelham (Trenton) Limestones.*
	(c) *Siliceous (Knox) Dolomite and Chert.*
(1) *Cambrian*...............	(b) *Montevallo [Variegated] Shales.*
	(a) *Weisner Quartzite [Chilhowee.]*

In the *Crystalline or Talladega Slates*, believed to be altered Cambrian strata, in the S. E. ¼ of S. E. ¼ of S. 24, T. 24 N., R. 14 E., there is a potato hill or knoll of several acres in extent that is literally covered with loose limonite. This ore is said to have showed in an old well to its full depth of some 15 feet. It is small lump and gravelly ore with some few small boulders. It is seemingly of very good quality. Much of it is porous or honey-comb ore. The boulder ore is not so good, as a general thing, as the other ore, as it has in it some small siliceous specks.

These Crystalline strata show near their northwestern edge also outcrops of seemingly very good roofing slates. They also show in several places outcrops of semi-crystalline limestones or dolomites.

(a) *Weisner Quartzites.* This formation has been seen in Chilton county only as a few small detached patches cropping out from under the superficial covering of Cretaceous and Tertiary strata along the L. & N. R. R., between Clear Creek P. O. and Jemison, and along Mahan's Creek to the west. They are believed, however, to form some of the Crystalline or Talladega Slates.

[b] *Montevallo [Variegated] Shales.* This formation

forms a broken belt to the north and north-west of the Talladega Slates. It extends over 35 to 40 square miles of this county, though over half of its area in this county is covered by the unconformably Cretaceous and Tertiary strata. It has in it some outcrops of seemingly very good roofing slates. One of these outcrops near Clear Creek P. O., in the N. E. ¼ of N. W. ¼ of S. 34, T. 24 N., R. 13 E., has been dug into to a depth of some 20 feet. The slate of this pit is a fine grained compact rock with a good cleavage and with but few cross joints. It is tough enough to be punctured and has every appearance of being a good roofing slate, if it was properly quarried.

[c] *Siliceous [Knox] Dolomite and Chert.* This formation covers a couple of square miles in the north-east corner of the county and some 10 square miles in the north-west corner of the county. The small patch in the north-east corner of the county has in it a ledge of rough boulders of cherty fibrous limonite with a bony look and, in places, a scaly covering of botryoidal limonite. The belt acoss the north-west corner of the county is for the most part a piney woods with a superficial covering of Cretaceous and Tertiary strata. It abounds in the characteristic lime sinks. Some of its chert is oolitic.

[d] *Pelham [Trenton] Limestones.* This formation covers a small area, less than a square mile, in the north-east corner of the county, and 6 to 8 square miles in the north-west corner of the county. Both of its areas are low flat lands, though they show many outcrops of their strata.

[e] *Fort Payne Chert.* This formation occurs only as irregular detached hills and ridges along the south-east edge of the belt or valley of Pelham [Trenton] Lime-

stones across the north-west corner of the county. It is wanting in places here, as it is altogether in the north-east corner of the county, where it ought to be. In these places, it was either never deposited or, if deposited, was washed away before the overlying strata were deposited.

[f] *Oxmoor Shales and Sandstones.* This formation covers a couple of square miles in the north-east corner of the county and some 15 square miles in the north-west corner of the county. In both areas, it carries some little stratified limonite, in thin seams, and its black carbonaceous shales have been dug into for stone coal. It also has outcrops of blue and gray limestones with streaks and splotches of calcite. These limestones frequently take a very good polish and make quite pretty marbles.

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